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GUNSHOT FRACTURES

A Collective Review of the Literature of the Past Two Years

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IT was computed by Kirschner (27) that in the Spanish War 85 per cent of all the severely wounded and 92 per cent of the surviving gravely wounded soldiers had suffered gunshot fractures. German medical reports revealed that 63 per cent were gunshot wounds of the extremities and 25.7 per cent were gunshot fractures of the femur (24).

The basic treatment of compound fractures is the same, irrespective of their cause. It consists of débridement of the soft-tissue wound and reduction and immobilization of the fracture. Opinions vary greatly on technical matters, such as the choice of preoperative preparation of the skin, and the accomplishment of reduction, fixation, and immobilization of the fracture. Results depend less upon the technique of the minute application of basic principles, however, than upon when they are applied. Experience repeatedly has confirmed Friedrich's findings (14, 40) that infection of the soft-tissue wounds is minimized when less than six hours elapse between injury and débridement. War, particularly one of movement, introduces difficulties in collection, transport, and evacuation of the wounded. Treatment is delayed and the probabilities of infection increase. The medical problem, therefore, is to protect the wounded from infection during the lag-period between injury and treatment, and to bring surgery to the wounded or devise a method of rapid evacuation of the wounded.

Protection of the soldier during the lag-period is begun long before he reaches the combat zone. All soldiers of the American Army are given tetanus toxoid in three 1 cc. doses at intervals of from one to three months. When wounded, the soldier receives a fourth dose, or, if not in a combat zone, a booster dose of 1 cc. once a year, or when he enters the combat zone.

Results reported by the French and British Armies attest the effectiveness of this type of protection. Practically all soldiers of the French fighting forces were protected with toxoid inoculations before hostilities commenced. Only 1 soldier is known to have developed tetanus and his case was described as mild and of local character. Of a group of 18,000 wounded in Flanders who had elected to omit the injections with toxoid, 8 developed clinical tetanus; no case of tetanus was recorded among 16,000 similarly wounded but immunized soldiers (12). Among 6,500 British casualties, the only soldier who developed clinical tetanus had escaped immunization. No cases of tetanus developed in the immunized group, including wounded from Belgium and Dunkirk, many of whom had been virtually untreated and among whom a considerable number developed gas gangrene (36).

The Germans rely upon the wound toilet of Friedrich as the best defense against tetanus. In addition to surgery, they use tetanus and gas antitoxin during the narcosis incident to operation as they believe anaphylactic shock does not appear during narcosis (43). The incidence of clinical tetanus among wounded Germans in the German-Polish War, however, was 3.6 per 10,000 with a mortality rate of 60 per cent. Among the Polish, none of whom had received toxoid, it was 66 per 10,000 with a mortality of 53.5 per cent (52).

Gas gangrene was more prevalent in World War I than in recent wars. Trueta (47) remarks on an "almost complete absence of gas gangrene" among 1,073 compound-fracture cases from the

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Spanish War. Jolly (25) and D'Harcourt, Folch, and Oriol (9) reported a similar low incidence of gas gangrene among casualties of the Spanish Civil War. Wildegans (51) noted that in the Polish-German War infections with pyogenic organisms were more prevalent than in France in 1914, but gas gangrene was not the scourge it was at Verdun. Smith (42) attributed the total absence of gas gangrene among 15,000 casualties in the Syrian campaign to the liberal use, locally and systemically, of sulfonamides. Galloway (15) reported only 1 per cent gas gangrene among 301 cases of compound fractures resulting from aerial bombardments in a London area. Blondin, Leclerc, and Rouvillois (1) saw only 13 cases of gangrene among 475 badly neglected and grossly infected compound-fracture cases from the Vosges sector during the German invasion of France in the summer of 1940. Radley Smith (36), however, found that many of the wounded from Belgium and Dunkirk had developed gas gangrene.

Gas gangrene in the Spanish Civil War was infrequent because of early adequate débridement without primary closure of the wound and complete immobilization of the wounded member (9, 25, 47).

The ideal method of combating gas gangrene is by prophylactic means similar to those used against tetanus. Evidence shows this soon may be possible. Toxoid can be made of good antigenic value, as determined by animal inoculation and by the degree of antitoxin-binding power (44). Twelve persons, each inoculated with a total of three injections of bacillus-welchii toxoid, produced antitoxin in their serum. The injection of this human serum into mice protected them against living cultures of the Welch clostridia (34).

The value of polyvalent gas antiserum is questionable. Antitoxin in controlled experimental infections with various members of the clostridia group has proved of prophylactic and therapeutic value (17,20).

Although many reports state that sulfonamide therapy has materially reduced the incidence of gas infection in compound fractures (2, 4, 5, 6, 21, 22, 23, 32, 36, 49), it has not prevented gas infection (23, 32, 49). Adequate chemotherapy is no substitute for surgery (23, 32, 49), nor is there evidence that it reduces the amount of antitoxin needed (28).

The best treatment today is a combination of antiserum (polyvalent) administration, chemotherapy, and adequate surgery. Clinical and experimental data overwhelmingly support the opinion that local chemotherapy reduces the incidence of wound infection (23, 28).

Local implantation of sulfanilamide produces a concentration in the area of contamination 80 times that obtainable by systemic administration. The bacteriostatic and bactericidal power of the sulfonamides is a function of their concentration. Local implantation, therefore, is more effective in the prevention of infection of contaminated wounds than systemic administration. Sulfanilamide powder buried in a wound gradually enters the general circulation until a maximum concentration is reached in from eighteen to twenty hours, and disappears in approximately sixty hours.

From 5 to 20 gm. of sulfanilamide may be implanted in a wound without excessive systemic concentration of the drug. The blood level reaches its maximum in from eighteen to twenty hours. With the wound closed primarily, the blood level in milligrams per cent will be about the same as the number of grams of drug implanted (23). With the wound left open and covered with vaseline gauze, the blood level will be much lower and larger doses may be used. Sulfathiazole should be given systemically; 1 part sulfathiazole with 2 parts sulfanilamide is best for local use (20).

Each soldier in the field carries a first-aid kit containing bandages and medication. It has been suggested that one or two doses of nembutal (gr. 3 to 5) be included among the drugs because of the beneficial effect of the barbiturates in lowering the incidence of shock (10, 48). Included also are sulfonamide tablets and powder for oral and systemic administration.

In a wounded soldier who has been immunized with tetanus toxoid and who has received nembutal and sulfathiazole, practically all possibility of tetanus infection has been eliminated and the probabilities of shock and pyogenic and/or gas infection have been reduced. Treatment is continued by the first of the medical personnel to find the wounded soldier and a clinical history is taken. If sufficient time has elapsed the second dose of nembutal and sulfonamide is given. Morphine is administered at the direction of the doctor or nurse. Drugs and the time of their administration are noted on a clinical record.

Local treatment of a compound fracture consists of treatment of the soft-tissue wound and of the fracture. The British in World War I showed that immobilization with the Thomas splint reduced the mortality from a fractured femur in their army from 80 to 20 per cent (26). Today all medical personnel are taught the importance and technique of immobilization and traction. If the splint is not available the leg is immobilized to the other leg or to the soldier's rifle; the arm is

bound to the body. The soft-tissue wound is sprinkled with one of the sulfonamides from the first-aid kit and a firm compression bandage is applied to control hemorrhage. Tourniquets required to stop the bleeding are removed at the earliest opportunity and the blood vessel is ligated.

Virulent pyogenic organisms are not usually found in cultures of fresh wounds (13, 19, 29). Infections are usually the result of organisms introduced by attendants (13, 29). After a dressing has been applied, therefore, it is urgent to evacuate the wounded to a hospital for operation. Repeated dressings contribute nothing yet greatly increase the chances of infection. Rapid evacuation to a hospital may be accomplished by air, as by the Germans in their Polish campaign (11, 16, 41, 46), or as in the Spanish Civil War, by triage, wherein casualties are sorted and compound fractures rushed to a specialty group by ambulance (25). The American Army is studying the ability of mobile surgical units to travel with the armored divisions. Such units can perform almost all types of surgery (7, 10).

The many published articles on surgery of compound fractures agree that (1) surgery should be performed as early as possible; (2) the wound should not be closed; (3) the fracture should be reduced; and (4) the extremity should be immobilized (8, 9, 16, 18, 25, 26, 27, 30, 31, 32, 33, 35, 37, 39, 45, 47, 50, 53).

The surgeons of the Spanish Civil War standardized a technique, generally attributed to Orr, that fulfills these requirements, and proved that, because of the technique or of a standardization of treatment, the results were superior to previous ones. Articles by the Axis and Allied military surgeons have substantiated the findings of the surgeons of the Spanish War.

Briefly, the almost universally accepted treatment of compound fractures by surgeons in combat areas is as follows:

1. The patient is placed on an orthopedic table if one is available and fixed so that traction can be applied.

2. The skin is cleansed with soap and water if facilities permit. If the patient is near the front or with a mobile unit where water is scarce, washing is minimized. Antiseptics should not be placed in the wound (38), but they are often used to paint the intact skin about the wound.

3. Excision of the soft-tissue wound. This principle reverts to the eighteenth century. The French attribute it to Ollier. Friedrich demonstrated that the wound should not be excised after from four to six hours. The committee who studied the wounds treated at Pearl Harbor believed the period of excision could be greatly extended (53).

4. The fracture is then reduced. Only spicules of bone completely detached from the periosteum and displaced at some distance from their bed, should be removed.

5. The wound is packed open but not tightly, as such a procedure has all the disadvantages and none of the advantages of primary closure.

6. Steel pins of the Steinman type are cheap, of little bulk, and so easy to use that they should be included in even the meager equipment allowed mobile units. To put a steel pin through the calcaneus and incorporate it in a cast requires little or no additional time, yet greatly enhances the chances of maintaining good reduction.

7. The cast is the ideal means of immobilization. It is cheap, rapid in application, easily transportable, and readily obtainable, in contrast to metals, and gives excellent immobilization. Patients in casts are more easily handled than patients who have been immobilized by any other means.

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RUSSIAN WAR SURGERY

Military Medical Reports from Russia

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THE unprecedented intensity of land and air warfare on the Russo-German front is of tremendous importance to all those interested in war medicine and surgery. Not only have the numbers of wounded reached large proportions, but the medical organization necessitated by modern mechanized warfare has received its severest test. For this reason, any information which may be gathered from this tremendous experience is of paramount value to our armed forces, to surgeons directly concerned with the care of the wounded, to teachers training younger men for such work, and, finally, to investigators whose main aim is the advancement of methods for the care of such casualties.

Sources of such information are not many, as pointed out in a communication (2) in this Journal some months ago. All of those which were available to the author were consulted[1]. While details are difficult to obtain because of justifiable secrecy regarding war activity in general, it is hoped that what little data has been gathered will serve to fill in some of this gap of knowledge. In any case, it may serve to stimulate activity in developing new methods of organization, treatment, and research, and in promoting interchange of knowledge between this country and Russia.

ORGANIZATION FOR THE EVACUATION OF WOUNDED

The scheme for the evacuation of the wounded follows in general the traditional policy of graded centers extending from the front line to the rear, the first being the battalion, the second the regimental, and the third the divisional medical points at intervals up to six miles from the battlefield. Further in the rear are the mobile field hospitals, and specialized field hospitals. Further back still are the evacuation clearing points, and, finally, the sanatoriums for convalescents.

A special feature of this organization deserves comment.

"*Central Administration.* Just as co-ordinated medical practices become necessary in mobile warfare, so there must be central administration of the medical services on a front 1,800 miles long; there must be central direction so that no sector lacks medical facilities and personnel while supplies and doctors are idle in another.

"'Formerly every division had its hospitals,' explained Dr. Smirnov in a cable to Russian War Relief. 'If the division was in the rear or in reserve, its hospital remained inactive, while at some part of the front there might have been more wounded than could be taken care of. Even at the front some divisions, with light losses, would have idle facilities while other division hospitals would be overburdened.

"'The centralized administration of the medical services is directed by the chiefs of the given army, not the individual division. It is the duty of the medical chiefs to maneuver the facilities at their disposal to the best advantage. . . . Centralization has proved its value. It has saved a great deal of manpower and equipment by economical handling, and it has spread the burden more equitably over the entire army medical corps.'"

A radical departure, however, from the usual method of reaching the wounded with battalion stretcher bearers has been the organization of the Women Medical Orderlies, or field nurses, popularly called "front-line girl friends." During the first year of the war, 100,000 girls falling into this category were graduated from Russian Red Cross classes from among volunteers desirous of serving at the front. At present there are apparently several hundred thousand in active service. Not all of those offering their services are accepted inasmuch as these girls have to pass rigorous examinations before being allowed to perform the arduous and dangerous work. These field nurses operate in the line of fire and alone bring wounded soldiers back to the field dressing station. They have no stretchers but carry the wounded on their backs after administering the simplest of first-aid care. Such first aid consists largely of the application of a protective dressing to wounds, usually preceded by the implantation of sulfanilamide and the use of splints for fractures. Antitoxin can also be administered, and some of these medical orderlies apparently are equipped with a flask containing universal type blood so that they are able to give

[1]Information obtained from the Embassy of the U. S. S. R., Washington, D. C., and Russian War Relief Agency, New York, New York, through the kind co-operation of Messrs. V. Bazykin and Leo Gruliow, respectively.

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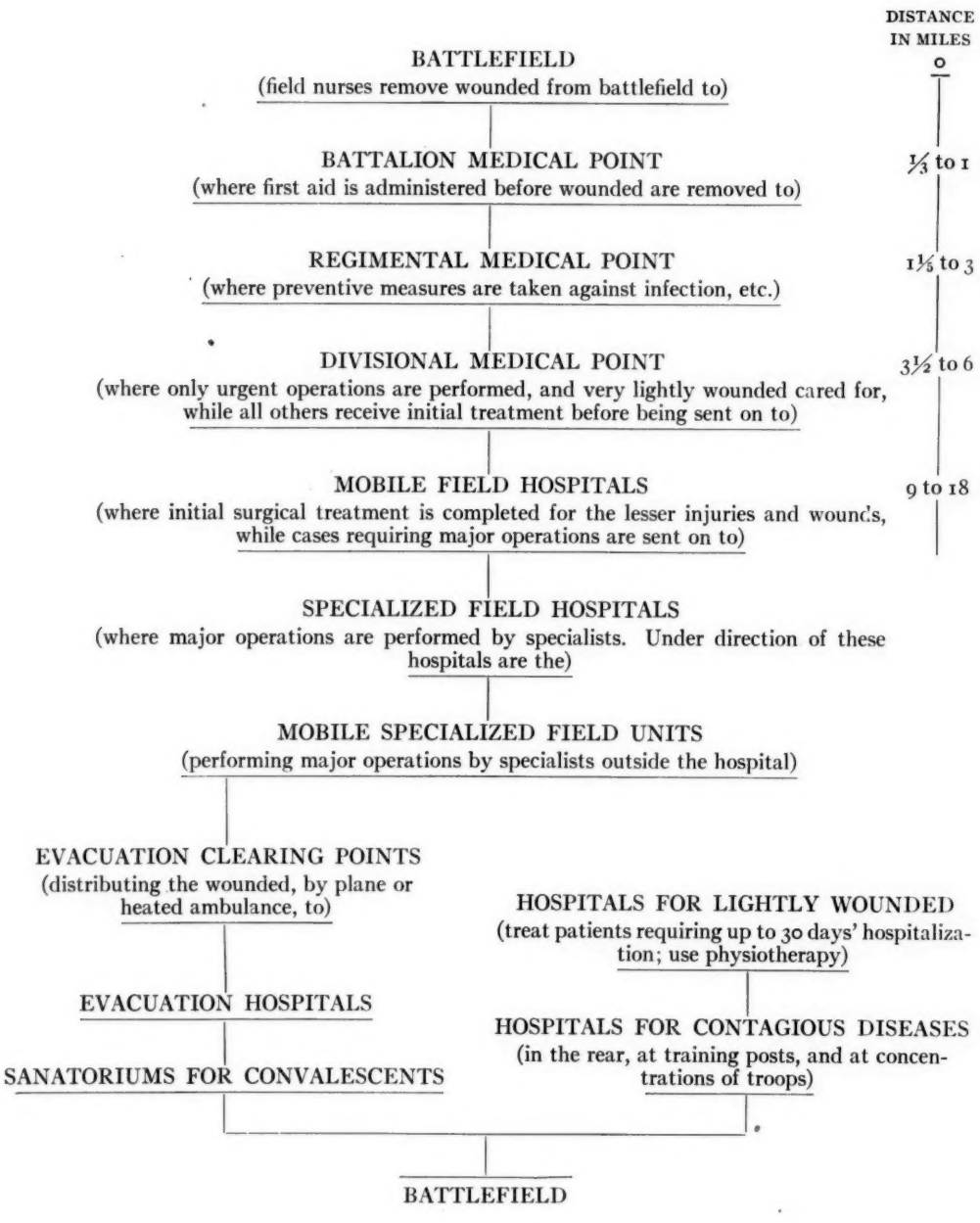
DISTANCE IN MILES
BATTLEFIELD
(field nurses remove wounded from battlefield to)
0
BATTALION MEDICAL POINT
(where first aid is administered before wounded are removed to)
⅓ to 1
REGIMENTAL MEDICAL POINT
(where preventive measures are taken against infection, etc.)
1½ to 3
DIVISIONAL MEDICAL POINT
(where only urgent operations are performed, and very lightly wounded cared for, while all others receive initial treatment before being sent on to)
3½ to 6
MOBILE FIELD HOSPITALS
(where initial surgical treatment is completed for the lesser injuries and wounds, while cases requiring major operations are sent on to)
9 to 18
SPECIALIZED FIELD HOSPITALS
(where major operations are performed by specialists. Under direction of these hospitals are the)
MOBILE SPECIALIZED FIELD UNITS
(performing major operations by specialists outside the hospital)
EVACUATION CLEARING POINTS
(distributing the wounded, by plane or heated ambulance, to)
EVACUATION HOSPITALS
SANATORIUMS FOR CONVALESCENTS
HOSPITALS FOR LIGHTLY WOUNDED
(treat patients requiring up to 30 days' hospitalization; use physiotherapy)
HOSPITALS FOR CONTAGIOUS DISEASES
(in the rear, at training posts, and at concentrations of troops)
BATTLEFIELD

Organization and structure of Red Army Medical Service
(Chart based on cable from Chief of Red Army Medical Service, Y. I. Smirnov).

at least small blood transfusions right on the field before subjecting the injured to the inevitably deleterious procedure of transportation.

This particular method of evacuating the wounded undoubtedly cuts down the period of delay in treatment considerably and is probably responsible for a diminution in the early deaths following injury. Indeed, the figures on mortality and rehabilitation are impressive, as will be discussed later. Moreover, the effect of such almost immediate evacuation of the wounded from the battlefield must play a tremendous part in increasing the morale of the soldier. One detail pertaining to the work of these medical orderlies is the reward (military orders of distinction) given to them for the achievement of a definite number of evacuations from the battlefield "together with their rifles, submachine guns and light machine guns." One of these volunteers, twenty-three-year-old Alexandra Kalenina, carried off a hundred men from the field together with their arms in a single day of battle.

SURGICAL CARE OF WOUNDS

Three problems are emphasized in the care of the wounded, i.e., shock, infection, and delay in definitive therapy. Infection has been combated with the use of the sulfa drugs as well as by extensive use of immunotherapy for gas gangrene and tetanus. It is not clear whether tetanus toxoid is used as routinely in the Russian army as it is in the American army, but Burdenko reported that among 10,000 wounded soldiers, there were only 2 cases of tetanus and only 6 cases of gas gangrene. In the first two and one-half months of the year, however, Kupriyanov reported that gas gangrene cases were under 3 per cent.

The types of wounds encountered in the present war are reported as strikingly different from those in the first World War, when but 50 per cent of the wounds were caused by explosives; in the present conflict, 95 per cent fall into this category. This is due to the large number of mines and mortars now employed. This difference is especially significant in wounds of the skull and brain, which in the first World War were caused mostly by bullets; at the present time only about 20 per cent of these wounds are caused by bullets, the rest being produced by splinters from shells and mines.

The much debated question of open or closed treatment of surgical wounds has received just as much attention in Russia as it has elsewhere. Open treatment of the wound with later secondary surgical treatment seems generally adopted at the present time. Primary suture on the battlefield is prohibited except in certain chest wounds. However, the sulfa drugs are used universally throughout all stages of the treatment. Local anesthesia seems to be preferred to other types. In particular the methods used by Vishnevsky are emphasized, by which large quantities of a ¼ per cent novocaine solution are injected in layers so that the field of each injection overlies the previous one. Novocaine is also used with the procedure of iontophoresis, as elaborated by Poznansky and Rubenstein.

No direct information was available as to the treatment of burns although, from the fact that tannic acid was sent in medical supplies to Russia, it is believed that the tanning method is used. From indirect information obtained by the present author it seems that many burns are now being covered with a layer of pine sawdust and then bandaged. This material is being used (1) because it is plentiful, and (2) because of its apparently beneficial local influence, i.e., it seems to exert an absorptive, cushioning, and antiseptic effect.

According to direct and more recent information (4) rapid coagulation of burns with silver nitrate and tannic acid after cleansing with a one-half per cent ammonia solution is widely used when large numbers of burns have to be treated and evacuated in a hurry. Vials containing ethyl chloride are inhaled or evipal is injected as a general anesthetic. However, on other occasions plaster casts are applied to burns of the extremities, torso, and even face. Chemotherapy is used extensively but infection is still a problem. In addition to plasma and blood transfusions, injections of sodium hyposulfite and methylene blue are used in severe burns. The use of methylene blue as a catalyst is based on experimental studies; of interest are recent studies in this country (5) in which methylene blue was shown to be of value in tourniquet shock in dogs.

In the treatment of wounds complicated by fractures, the plaster-cast treatment as advocated by H. Winnett Orr is widely used throughout the Red army and is highly praised. Besides its well known therapeutic value, considerable economy in dressing materials is attributed to this method of therapy, a factor of no small importance in wartime Russia.

THE TREATMENT OF SHOCK

The importance of intravenous injections in shock is, of course, widely recognized. Although blood and plasma are used extensively in Russia in this treatment, the large scale use of desiccated plasma apparently has not achieved the development it has in this country. Much more whole blood is used, preservation being achieved with

the addition of dextrose. All soldiers as well as donors are typed, although it is not clear whether crossmatching is performed before transfusion is given. The entire civilian population donates blood through local organizations in a way quite similar to the methods used by the Red Cross in this country. A personal touch has been added, which is made possible by the use of whole blood rather than pooled plasma, i.e., each donor may attach to the flask containing his blood a message of encouragement and sign his name.

Whole blood of the universal group apparently is employed widely. Each individual knows his own group and those falling into the universal group will often donate their blood right on the battlefield. For this purpose a flask containing citrate is provided; it is similar to those we use in this country for the collection of blood. Under these conditions a transfusion can be given within a short time after it is obtained from the donor.

Other solutions for the treatment of shock have been used, notably one advised by Professor Seltovosky; however, it is difficult to determine the nature of this in all detail, although it contains sodium and potassium chloride, magnesium sulfate, glucose, and a small amount of alcohol. This "stimulative" fluid was tested in numerous hospital clinics and at the front line, and in cases of shock gave stable increases in blood pressure. Another solution mentioned in the restoration from shock is described merely as consisting of "concentrated mitogenetically active amino-acids"; this work is being done by Professor Bryness. Bagdasarov (1) also mentions without any detail other solutions possessing colloidal properties because of the addition of specially prepared casein.

An entirely different approach to the treatment of shock was introduced by Lena Stern (7), professor of physiology at the Second Moscow State Institute. This approach is a neurological one, the idea being to counteract the excessive parasympathetic stimuli and at the same time stimulate the sympathetic fibers. This is achieved by the injection into the fourth ventricle of 1 cc. of one-sixth molar potassium phosphate (either K_2PHO_4 or KH_2PO_4 adjusted to a pH of 7.6). It was claimed that the potassium stimulates the sympathetic system whereas the phosphate, by removing ionic calcium, inhibits the excessive parasympathetic stimulation. While details are not available, this new approach to therapy was based upon extensive experimental work and has afforded favorable impressions. On the other hand, a recent experimental study in this country (6) has failed to confirm Lena Stern's findings.

THE RESULTS OF TREATMENT

Statistical analyses of the results of treatment are usually open to many errors. On the other hand, they furnish the only objective method of determining the efficiency of treatment. In our own experiences, the results at Pearl Harbor showed a mortality of 4 per cent, although perhaps the situation here should not be taken as representative of subsequent engagements with the enemy. Indeed, more recently, reports of our naval engagements in the South Pacific indicate a mortality of under 1 per cent of those treated. As far as can be determined, no figures on rehabilitation have as yet become available.

The Russian figures present a mortality of only 1.5 per cent of all Russian wounded, according to Professor Sergei Spassokukotsky, the seventy-two-year-old dean of Russian surgeons, in a radiogram to the Russian War Relief national headquarters in New York. Of the wounded who recovered, 70 per cent of the total have already been returned to the ranks and 10 per cent are still undergoing treatment and are expected to be returned to service very soon, according to Yefim I. Smirnov, Chief of the Red Army Medical Service Administration.

Information from Russia contains a few figures in regard to the German results in the treatment of wounded on the Eastern front. Smirnov and Burdenko both estimated that about 40 per cent of the German wounded were returned to the ranks. Professor Spassokukotsky stated that it was his belief that the mortality among the German wounded was appreciably higher than that among the Russians. It is *stated* that captured German field surgeons supported this view. One of them is said to have admitted that 40 per cent of his wounded perished, from 35 to 40 per cent remained cripples, and only 20 per cent returned to action. It was also stated that the "Germans seldom give blood transfusions or plasma injections within 100 miles of the front"[1], and again, "the Germans abandon their seriously wounded on the battlefield."

PROBLEM OF MEDICAL EDUCATION

Just as we did in this country, the Russians accelerated their medical education with the onset of war. Whereas in peacetime 10,000 medical students were graduated yearly, during the sixteen months of war 42,000 have been graduated.

[1]This statement receives corroboration in the (British) *Bull. of War Med.*, 1943, 3: 276, wherein is discussed a current German paper in which direct transfusions of not more than 500 cc. are advocated. This "point of view is, of course, approximately twenty-five years out of date and is presented here simply because it may be of interest as representing what is apparently quite a widespread medical opinion in Germany judging by other recent articles."

The tempo is still being increased, a class of 24,000 being planned for the semiannual graduation in May, 1943. According to more recent information (5) the medical course has now been lengthened from three to five years to avoid having too large a number of incompletely educated doctors after the war. Of interest was the evacuation of medical schools in areas conquered by the Germans, such evacuation being given priority along with "other valuables." For example, the entire faculty and students of the First Kharkov Medical Institute, also books, laboratory equipment, and classroom necessities, were evacuated and reassembled three days later 1,000 miles to the east, the educational and clinical facilities being reorganized and started within a week after arrival in a cold town of the Ural mountains.

At least two features of Russian medical education offer a striking departure from our own facilities. One is the fact that half of the Russian doctors are women, this percentage having increased during the war. In addition, there are 400,000 "feldschers," of which more than half are women. This personnel must not be confused with nurses or army medical-corps personnel. The feldscher is known throughout Eastern Europe as a person with only one or two years of medical training, and equipped only for the most elementary medical duties. In Russia their duty is primarily to replace doctors in villages and small towns depleted by the needs of the armed services. They also see to the carrying out of public health measures, but do not serve with the army medical corps. As in the United States, medical teachers and students are deferred from the draft, but the further training of all graduates is apparently entirely military.

AMBULANCE PLANES

The use of ambulance planes for the evacuation of the wounded has been confirmed, but its extent is difficult to determine. The importance of ambulance planes in cutting down delay in treatment is obvious, but they have also been used in removing wounded from besieged cities such as Sevastopol, Odessa, Stalingrad, and Leningrad. Most of the planes used for this purpose are small outdated models, no longer fit for battle use. Not only were the wounded placed in the cockpit of the plane, but they were suspended under each wing in coffinlike stretcher boxes.

The Russians seem to have had long experience in using ambulance planes, largely because of the necessity of meeting the medical needs of the inhabitants of the vast Siberian Arctic spaces, where doctors are few and far between. It is stated, for example, that from 1934 to 1940 over 23,000 flights were made by specialists and professors, who conducted over 800 operations and 1,500 blood transfusions, and treated 98,000 patients, carrying nearly 12,000 patients to hospitals. Here, also, women are used to a large extent as pilots for ambulance planes. Altogether, Russia has 34,000 women pilots, most of them engaged in civil air field work or as instructors.

Fig. 1. Evacuation of wounded by air ambulance (women stretcher bearers). Note special compartment for stretcher patients lateral to fuselage. (Photo from Russian War Relief, Inc., New York.)

In the North African campaign 13,000 American wounded were evacuated by airplanes. "These planes came up as freighters and then were fixed to carry 16 litter patients back to the first base sector" (3).

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Fulcher, O. H.: Tantalum as a Metallic Implant to Repair Cranial Defects. *J. Am. M. Ass.*, 1943, 121: 931.

The repair of cranial defects is a frequent and important problem of military surgery. An adequate repair should render protection to the intracranial structures against blows, changing atmospheric pressures, and changing bodily positions. Many previously described methods of repair are unsatisfactory. Vitallium plates give good results but require casting, and they cannot be cut, hammered, or bent. Since the mold for casting is made over the soft tissues, the plate rarely fits snugly and in the majority of cases a compromise in adjustment will be required.

The author reports a case in which a tantalum plate was used to correct a cranial defect in the frontal region of the face. A mold of the cranial defect was prepared and a tantalum plate 25 mm. thick was cut approximately to the correct size by means of tin shears. This plate was then hammered to the desired contour, which could be determined by the mold and by application of the plate over the frontal boss of the patient. Following this, the plate was further trimmed to the perfect size. Three perforations were made to permit the escape of serum, and the plate was sterilized by boiling. The cranial defect was explored under local anesthesia and the pericranium about the border of the defect was elevated. The prepared tantalum plate was laid in place and its size marked by means of a sharp knife. The plate was then removed and its bed was prepared by the use of a chisel and a motor-driven emery wheel. The depth of this bed was equal to the thickness of the inlay so that there would be no depression or elevation of the margins of the plate. The plate was dropped in place, the available pericranium placed over its border, and the skin closed with fine sutures. An excellent cosmetic and functional result was obtained in a short period of time, and the plate seemed to fulfill all the criteria of an adequate repair. The type of defect, the final result, and the method of repair are illustrated.

Tantalum has approximately the physical properties of cold rolled steel and the chemical properties of glass. It is inert and can be cut, bent, or hammered. It is sterilized by boiling or by other recognized chemical methods. It has been demonstrated by animal studies and by biopsy that soft tissues have adhered to tantalum to the extent that it has to be removed by a periosteal elevator. These properties make tantalum adaptable to the repair of defects occurring in the cranium.

JOHN L. LINDQUIST, M.D.

Gurdjian, E. S., Webster, J. E., and Arnkoff, H.: Acute Craniocerebral Trauma. *Surgery*, 1943, 13: 333.

Post-mortem examinations were made on 151 patients who died following cranial trauma and the pathological data were correlated with clinical data from the hospital records when available. The pathological classification was made on the basis of the outstanding type of lesion present, and an analysis of the age distribution, the cause of death, and the time of death was presented.

Among 133 cases, 61 victims were dead upon admission to the hospital and 36 died within twenty hours; these represented 72.1 per cent of the total. The middle third of the skull was the most frequent site of fracture and the inferior surfaces of the frontal and temporal lobes were the most frequent sites of contusion. Epidural and subdural hemorrhages occurred in 21.5 per cent of the whole group of 151 cases studied. A subdural hematoma of surgical proportions (30 gm. and over) was found in 22 cases, while small subdural hemorrhages were found in 12 additional cases. The larger subdural hemorrhages were unilateral in each instance and occurred in the frontoparietotemporal region in the majority of cases. A frontoparietal trephine opening 2 in. on either side of the midline would have uncovered the clot in 30 of 34 cases. The position of the subdural clots could not have been guessed on the basis of the fracture lines.

There were 11 cases of epidural hemorrhage of surgical proportions and 4 cases of less than 30 gm. The larger hematomas were intimately related to fracture except in 1 case, and 8 of the larger epidural lesions were in the frontoparietotemporal region. Massive intracranial hemorrhage due to trauma is usually on the surface of the brain and may be amenable to surgical treatment. Large intracerebral clots are rare. A further analysis of cases with petechial hemorrhages, cases with no skull fracture, and cases with concomitant injuries is presented.

A study of the hospital records showed that in 4 of 10 patients with signs suggesting a progressive lesion, subdural or epidural hemorrhage was the cause of death. Two of these were operated upon. In 4 of the patients there was diffuse brain injury, and in 2, fatty cerebral embolism. In only 2 instances were the patients described as being in shock.

JOHN L. LINDQUIST, M.D.

EYE

Scheffler, M. M.: Visual Loss Following Distant Hemorrhage. *Arch. Ophth.*, 1943, 29: 449.

A case of visual loss following extensive bleeding from a peptic ulcer is reported, the blurring of vision

occurring nine or ten days after the hemorrhage. There was papilledema, very severe in one eye; in this eye vision was reduced to counting fingers at one foot. There was a marked visual field defect involving the fixation point in this eye and a milder heteronymous nasal defect in the visual field of the better eye. Seventeen days later the vision in the poorer eye had improved to 20–200 but there was some pallor of the disc. The case was not followed long enough to determine the eventual outcome.

Visual loss following distant hemorrhage is a rare syndrome, most frequent in the younger age group, and it is usually bilateral. No single factor is responsible but it usually occurs following recurrent loss of blood due to medical conditions; as a rule it is noted from three to eight days after the hemorrhage. The prognosis is poor in about half of the cases. Immediate blood transfusions may be helpful.

WILLIAM A. MANN, M.D

Guy, L. P.: Surgical Construction of a Lacrimal Passage. *Arch. Ophth.*, Chic., 1943, 29: 575.

A method is reported of forming a new epithelial-lined passage from the conjunctival sac to the nose to facilitate the drainage of tears in a case with congenital absence of the tear passages. While the method was employed in only one instance the excellent result obtained would justify further operative attempts along the same line with utilization of the same principles. Two years after the operation the new passage still has a function of 75 per cent as compared to the normal tear passage on the opposite side.

The case reported is that of a ten-year-old girl with a history of epiphora from the left eye since birth. This had been so severe that during the winter months there had resulted painful and disfiguring chafing of the left side of the face. The right eye, including the tear passages, was entirely normal. Corrected vision in the left eye was 20/70 and there was a nonaccommodative esotropia with fusion limited to intermittent simultaneous macular perception. Examination of the lacrimal gland showed no abnormality and there was no obstruction in the nose. Tears accumulated so rapidly that they had to be constantly wiped away from the left eye. The area of the lacrimal sac was explored and no sac, canaliculus, or other structures were found in the lacrimal passage. There was an abnormal spur of bone 4 by 4 by 2 mm. in the floor of the fossa.

It was therefore decided to attempt construction of a new passage lined with epithelial tissue to prevent subsequent closure. Under general anesthesia the lacrimal fossa was exposed through a crescentic incision about 18 mm. in length. and just nasal to the anterior lacrimal crest. An opening was made into the middle meatus from the lower portion of the lacrimal fossa after the anterior crest and the bone spur previously mentioned had been removed. A 6 mm. hand trephine was used to start the opening, which was enlarged by means of a Kerison clamp. With a long narrow scalpel a passage 3 mm.

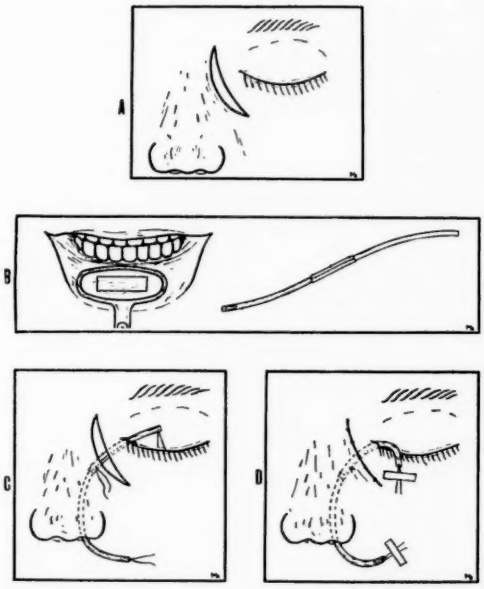

Fig. 1. A, Site of incision; B, mucous membrane from the mouth sutured on a rubber tube; C, the passage lined with mucous membrane; and D, schematic appearance after completion of operation.

in diameter was made from the ordinary location of the lower punctum to the opening in the fossa. A piece of mucous membrane 20 by 30 mm. was then removed from the lip and fastened to a 2 mm. hollow rubber catheter by means of interrupted black silk sutures with the epithelial lining turned in and the freshened dissected submucous side turned out so that it might become engrafted to the tissues of the new passage. The tube and mucous membrane surrounding it were then placed into the prepared passage and anchored so that the graft lined the entire passage. One end then extended out of the new opening in the lid into the conjuctival sac and the other was pulled into the nostril. A pressure dressing was used for twenty-four hours. On the sixth day the anchoring sutures were removed and the upper end of the rubber tube was cut off, the remainder then being gently pulled down through the nose.

On the ninth day the new passage was found patent by irrigation. On the twelfth day mercurochrome entered the nose twelve minutes after being placed in the conjunctival sac. The epiphora has been largely eliminated during the two years since the operation.

While this particular type of congenital absence of the lacrimal passages is rare the method of correction seems to present considerable merit.

WILLIAM A. MANN, M.D.

Leahey, B. D.: Corneal Transplantation. *N. England J. M.*, 1943, 228: 387.

The author discusses keratoplasty or corneal transplantation for the restoration of sight to eyes blinded by opacities of the cornea. He points out that there are four types of keratoplasty: total lamellar, circumscribed lamellar, total penetrating, and circumscribed penetrating, of which the last is the most popular operation at present. In this operation a central window from 4 to 6 mm. wide is cut through the full thickness of the opaque cornea and replaced by a similar area from an enucleated eye. The most suitable cases for keratoplasty are those in which the eye is normal except for leukoma or scarring which is not dense or vascular and which is surrounded by a clear or slightly scarred cornea. Cases of old interstitial keratitis or conical cornea, or with dense scarring of the cornea or vascularization, are unsuitable but may be rendered more suitable by the removal of pannus and the sealing of the corneal vessels at the limbus with diathermy. Any enucleated eye with a clear cornea or the eye of a stillborn baby may be used as the donor eye.

A square 4 by 4 mm. is cut two-thirds of the way through the cornea with a double parallel-blade knife. Then an oblique penetrating incision is made at the upper edge into the anterior chamber with a small triangular knife or keratome; the square of cornea is excised with scissors and the window is replaced by a transplant cut from the donor's eye with the same knife. Cross-stitches are inserted to prevent dislocation of the graft and atropine is instilled. The patient is confined to bed for from ten to twelve days and both eyes are kept covered for from eighteen to twenty days. At the end of one month the graft is firm and usually clear. The graft usually takes even in unfavorable cases, but in these cases it becomes cloudy as a result of vascularization and proliferation of the connective tissue on the posterior surface of the cornea, or because of degeneration in the deep parts of the cornea.

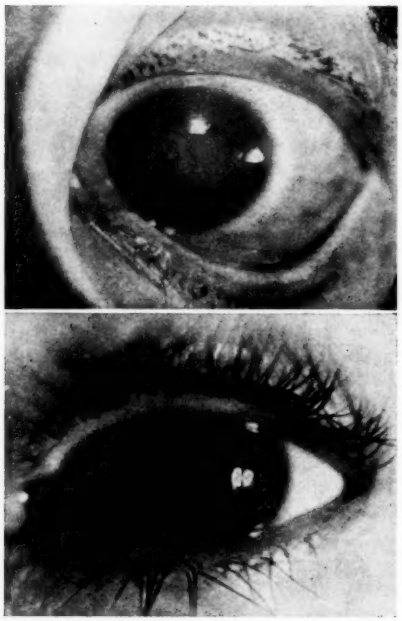

Fig. 1. Case of corneal transplant showing the eye before and after keratoplasty.

The author reports 10 cases of keratoplasty performed on eyes which had less than 5/200 visual acuity. All grafts took and all cases were improved. As a rule it is advisable to confine keratoplasty to suitable cases which have a visual acuity of 15/200 or less. JOSHUA ZUCKERMAN, M.D.

Woods, A. C.: Syphilis of the Eye. *Am. J. Syph.*, 1943, 27: 133.

The author points out that the eye or its adnexa becomes involved in 5 per cent of all cases of syphilis, and that lesions occur frequently in congenital syphilis, rarely in primary, acquired syphilis, and frequently again in early and late acquired syphilis. He discusses ocular lesions of syphilis in relation to the type and stage of the disease in which they occur.

Complications of congenital syphilis. The dissemination of treponemas throughout the entire eye accounts for the high incidence of ocular disease in congenital syphilis.

The first period of congenital syphilis extends from birth to about the second year of life. Optic neuritis, iritis, and iridocyclitis are rarely observed clinically; chorioiditis is common. Chorioiditis may occur as circumscribed focal lesions with scars and clumps of chorioidal pigment or as an involvement of the peripheral chorioid, forming the "salt and pepper" or "snuff-tobacco" fundus. Sulfarsphenamine given intramuscularly and mercury inunction in alternate courses of several weeks, each for a period of eighteen months, are advocated.

The second period of congenital syphilis includes the second to the eighth year. In this period interstitial keratitis, which is more frequent during the second decade, may be encountered. Severe inflammatory symptoms, circumcorneal congestion, lacrimation, photophobia, and pain associated with generalized clouding of the cornea are usually followed by superficial and deep vascular invasion of the cornea, iritis, and uveitis. Vascular invasion of the cornea may become complete and be followed by clearing of the cornea from the periphery. The blood vessels remain throughout life as fine threads in the substantia propria of the cornea. If interstitial keratitis begins unilaterally, energetic antisyphilitic treatment with arsphenamine and bismuth should be continued for two years. Fever and malaria therapy, atropine, salicylates, and, after vascular invasion, irradiation with the beta rays of radium have been advised.

The third period of congenital syphilis extends from puberty to early adult life. Interstitial keratitis, eighth-nerve deafness, and neurosyphilis (with optic atrophy) occur in this period.

Ocular disease in early acquired syphilis. Primary ocular lesions in syphilis are rare. They are diagnosed by the dark-field demonstration of treponemas. Lesions of secondary syphilis are common. They include: (1) conjunctivitis; (2) rarely, interstitial keratitis; (3) iritis (73.3 per cent of the total eye complications of early syphilis), which may be plastic or nodular (iritis roseata, nodosa, or papulosa); and (4) optic neuritis, retrobulbar neuritis or neuroretinitis, and occasionally choked disc. Syphilis of the ciliary body appearing as a red, yellowish, or bluish-black nodule in the anterior chamber or on the sclera, is rare. Syphilitic chorioretinitis may be manifested, not as the "salt and pepper" fundus of congenital syphilis but as a diffuse chronic chorioretinitis of the macula and of the posterior pole. Disseminated chorioretinitis, syphilitic arteritis, thrombosis of a retinal vein, and chorioretinitis juxtapapillaris may also occur.

Ocular disease in late acquired syphilis. Gummas of the conjunctiva may appear as small pinkish tumors. Gummas of the eyelids simulate cutaneous lesions of late syphilis. Syphilitic ulceration or diffuse thickening of the tarsus is rare. Syphilis of the orbit may occur as periostitis, osteitis, or a gummatous infiltration associated with pain, exophthalmos, paralysis of the extraocular muscles, ptosis, abnormal pupillary reactions, and secondary atrophy of the optic nerve. Inflammatory ocular lesions include uveitis and secondary keratitis—keratouveitis.

Neuro-ocular lesions of late meningovascular neurosyphilis. Paralysis of the cranial nerves, most frequently the sixth nerve which supplies the muscles of the eye, and involvement of the optic nerves and tracts by inflammatory processes at the chiasm and the intrapeduncular space result in choked disc. Optic neuritis is rare.

Degenerative neurological lesions. Argyll-Robertson pupils, paralysis of the oculomotor nerves, and primary atrophy of the optic nerves occur especially in tabes dorsalis and taboparesis.

Atrophy of the optic nerves is the most important of all ocular complications of late neurosyphilis. Following subdural treatment with arsphenamized serum only 50 per cent of a series of patients became blind. Favorable results have been obtained by induced malaria. Of a series of 16 patients only 14 per cent became blind and the remainder retained the vision they had had previously.

JOSHUA ZUCKERMAN, M.D.

EAR

McCoy, D. A.: The Prevention of Ear Disability. *J. Am. M. Ass.*, 1943, 121: 1330.

The two types of ear damage common among industrial workers are "boilermaker's deafness" and direct damage to the external canal, ear drum, or middle ear by flying hot metal. Boilermaker's ear is well known among workers and is due to the acoustic trauma caused by prolonged and repeated exposure to very loud noises particularly of the high frequency range. It is common in the aircraft and shipbuilding industries. Damage to the external auditory canal, drum, or middle ear by flying hot metallic particles is common in the latter industry among the "chippers" who follow the welders and chip away the hot weld metal.

Fig. 1. General shape of ear mold.

Previous remedies have consisted chiefly of cotton stuffed in the ears, or of rubber ear plugs. Dry cotton plugs protect from noise only to the extent of from 10 to 15 decibels and are therefore inadequate. Rubber ear plugs protect from noise to the extent of from 20 to 25 decibels, but because of the pressure necessary to keep them in the ear they tend to develop sore areas. The problem has been to devise an ear stopper which eliminates the hazards of intensive noise, and protects from foreign material, and which may be worn for long and repeated periods.

A plastic mold of the external canal down to the bony portion and the related portion of concha has been devised. After placing two cotton balls in the bony canal, a plaster mold is made, from which an exact reproduction in transparent plastic lucite is prepared. Each ear has its own individual lucite mold which can easily be inserted and remains in place securely without developing pressure points. The molds were tried by 30 workers in the California Shipbuilding Corporation and were given preference to other types of ear stoppers. The noise level is reduced from 25 to 30 decibels in the speech range and from 30 to 40 decibels in higher frequencies by these molds. The hazard of loud noise and the irritative symptoms from prolonged and repeated exposure are eliminated. Slag burns and foreign body penetration are prevented. Approximately 500

workers have voluntarily bought the mold without any advertising by the mold company.

JOHN R. LINDSAY, M.D.

Thorne, I. J.: The Administration of Helium and Oxygen Mixtures in the Treatment of Disabling Ear Symptoms Caused by Changes in Atmospheric Pressure. *U. S. Nav. M. Bull.*, 1943, 41: 378.

The condition known as "ear block" among personnel working in compressed air, or "aero-otitis media" in aviation circles is the cause of serious disability.

The condition develops as a result of failure of the eustachian tube to open and permit equalization of the pressure in the middle ear as the external air pressure is increased. It develops in compressed-air workers as the pressure is increased in the compression chamber, and in aviators during rapid descent. During decompression or ascent the tubes open without voluntary effort, but during compression voluntary effort by certain maneuvers such as swallowing or yawning is necessary to permit equalization of pressure.

In the presence of an upper respiratory infection the eustachian tubes open less easily and ear block or aero-otitis media may develop regardless of the utmost voluntary effort.

When symptoms of "ear block" appear during compression much time is lost while the compressed air is turned off and the worker removed. If treatment fails to relieve the tendency to block, from seven to fourteen days are required for subsidence of the infection before he can again tolerate compression.

If the ear block is allowed to develop, pain, deafness, hemorrhage, and exudate of serum into the middle ear occur. A differential of 5 lb. is sufficient to rupture the drum; and this may be followed by purulent otitis media and exclusion of the individual from work in compressed air for a long period.

The same condition may occur as a result of eustachian-tube block during aerial descent. In high-altitude flight involving the respiration of 100 per cent oxygen the upper respiratory passages and eustachian tubes become filled with oxygen. If the tube becomes blocked on return to ground level or after taking off the oxygen mask the slow absorption of oxygen may produce a negative pressure sufficient to produce an aero-otitis media syndrome. Frequently a pilot may awaken from sleep after a high-altitude flight with symptoms of aero-otitis media which may require a rest period of from seven to fourteen days.

Two methods were used to treat compressed-air personnel complaining of ear block: the nasal drop and the helium-oxygen treatment. The former consisted of the instillation of ten drops of ½ per cent neosynephrin-hydrochloride solution in each nostril, with the patient's head hyperextended over the end of the examining table and slowly rotated from side to side. Then the patient was seated on a stool with the head between his knees and rotated from side to side. Following the treatment a test was given in the medical compression chamber. If he could tolerate 10 lb. of pressure he returned to work; if not, he was treated three times daily until able to return to work.

The helium-oxygen treatment consisted in the inhalation of a mixture of 80 per cent helium and 20 per cent oxygen for from three to five minutes, the expired air being led off by means of an expiration valve. A test in the medical compression chamber followed each period. If successful, two more minutes of treatment were given and the worker returned to work.

One hundred and fifty-three cases were treated by each method. The nasal-drop method was successful in 42 per cent of the cases, while the helium-oxygen treatment was successful in 92 per cent. The helium-oxygen method is recommended for aviation personnel as a prophylactic measure.

JOHN R. LINDSAY, M.D.

Schick, A.: The Treatment of Ménière's Syndrome with Magnesium Salts. *Ann. Otol. Rhinol.*, 1943, 52: 45.

Considering the importance of the vasomotor disturbances in Ménière's syndrome, Schick treated 18 cases of Ménière's syndrome, nearly all of which were of the idiopathic form, by means of intravenous injections of 5 cc. of a 50 per cent magnesium sulfate solution. The injections were given two or three times a week, from 10 to 20 injections altogether, depending on the response of the individual patient and the severity of the syndrome. Sometimes the treatment was repeated after a few months. The injection must be administered at an extremely slow rate with the patient in the recumbent position. Observing these precautions, the author never noticed any discomfort.

In many instances the success was striking. The effects of the treatment are gradual. In favorable cases the seizures disappear completely or grow milder and less frequent. In some patients having persistent tinnitus and a diminished hearing, even these symptoms show improvement. Of the 18 patients studied, 7 had no attacks during a period of fourteen months, 7 showed marked improvement, and 4 failed to respond to treatment.

NOAH D. FABRICANT, M.D.

NOSE AND SINUSES

Wolfe, M. M.: Rhinophyma, with New Etiological and Therapeutic Considerations. *Laryngoscope*, 1943, 53: 172.

Rhinophyma is a condition in which there is a chronic hypertrophy of the cutaneous and subcutaneous tissue of the nose with resultant lobulations and disfiguring enlargement. This hypertrophy usually involves the lower half of the nose and is resilient to palpation. As the result of this hypertrophy, the glandular openings are large and vas-

cularity is greatly increased, which imparts a purplish-red color.

All cases of rhinophyma mentioned in the literature were reported to have resulted from a chronic acne rosacea; therefore, the commonly accepted predisposing cause of this disease is chronic acne rosacea, of which it is the terminal stage. This may be incidental rather than causative of rhinophyma. It may be that the causative agents of acne rosacea and rhinophyma are the same. Since rhinophyma is most common at about the fifth decade, it may be that the condition is allied to the alteration in the elaboration of the sex hormones, principally the androgens, which occurs at this time.

A detailed report of a case of rhinophyma was presented with hitherto unpublished laboratory findings and correlations. Vitamin C deficiency and a predisposition to hemorrhage were observed. The etiological findings previously reported were absent in this case. The patient was prophylactically treated with vitamin C, koagamin, and koaginol, which minimized the bleeding during operation and prevented postoperative hemorrhage. The possible causative role of the sex hormone and of vitamin C deficiency in rhinophyma is discussed.

JOHN F. DELPH, M.D.

Stahl, R. H., Voorhees, D. G., and Davol, R. T.: A Survey of Antral Surgery; Review of 100 Cases. *Laryngoscope*, 1943, 53: 186.

An attempt was made to evaluate end-results from antral surgery in chronic maxillary sinusitis. One hundred cases were analyzed; in 50 the Caldwell-Luc operation was performed and in 50 antrostomy was done. The patients were from the outpatient department of the New York Eye and Ear Infirmary and were operated upon during 1940 and 1941.

The antral irrigation was found to be the simplest and easiest approach when used repeatedly. In a large number of cases the antrostomy opening was found to be quite small and located superiorly, just beneath the attachment of the inferior turbinate and usually quite well posteriorly, and in such a position the aperture certainly did not permit drainage or ventilation. The purpose of the procedure had then been defeated.

Failures are best explained at the present by: mistaken diagnosis, failure to eliminate adjacent foci of infection, too small an antrostomy opening, failure to correct pre-existent anatomical defects, and improper surgical technique. The Caldwell-Luc operation presented a clear wash in 54 per cent of the cases and antrostomy, in only 26 per cent of the cases, over an average period of six and one-fourth months.

The indication for antral surgery was found to be relative rather than absolute. Absence of absolute indication for antral surgery in cases of chronic maxillary sinusitis was probably an important factor in the poor results which were obtained.

JOHN F. DELPH, M.D.

PHARYNX

Fabricant, N. D.: The Effect of Cigaret Smoke on the pH of the Throat. *Arch. Otolar.*, Chic., 1943, 37: 404.

Despite the fact that the annual consumption of cigarets by the American public has been continually increasing, little substantial scientific research on the effect of cigaret smoke on the upper respiratory tract of normal persons has been recorded in the medical literature. Recently, the role of the hygroscopic agent—glycerin or diethylene glycol—in irritation of the respiratory tract has received some interest. Various approaches to the problem have been employed in the published reports.

In this study, Fabricant utilized a glass electrode in conjunction with an electrometer for the purpose of measuring the effect of cigaret smoke on the normal, physiological range of the pH of the mucous membrane of the human throat. In essence, studies of the pH of the mucous membrane of the human throat apply a laboratory procedure in a clinical environment. The subjects were 100 men and women with clinically normal throats.

Three kinds of cigarets were used in the experiments: the first, a cigaret using glycerin as the hygroscopic agent; the second, a cigaret using diethylene glycol; and the third, a cigaret which was specially made so as to contain no hygroscopic agent. In the conduct of the experiments, the speed and volume of the puff, the frequency and number of puffs, and the position of the cigaret while burning were left entirely to each smoker's preference and habits. Some of the smokers discarded a cigaret after a half-dozen puffs; the majority, however, discarded it much later. While some inhaled deeply, others did not. Each smoker was cognizant of the type of cigaret he was smoking. No attempt was made to alter in any way a smoking technique which may be called the average smoking habit.

By conducting minute to minute readings of the pH values of the mucous membrane of the human throat, it was possible to show satisfactorily the effect of cigaret smoke on the pH of the throat. It is significant that the normal, physiological range of pH values for the throat in men and women with clinically normal throats lies between 4.9 and 8.0, the reaction in the majority of cases falling within the acid range. While the values varied with different persons, for the same subject the range was small and fairly constant. The 100 subjects undergoing pH measurements in the series recorded were, for the most part, accustomed to smoking either habitually or occasionally; several persons were nonsmokers.

Cigaret smoke, regardless of the absence or presence of a hygroscopic agent and of the kind of hygroscopic agent present, in no way altered the normal, physiological pH range of their throats. In terms of effect on the pH of the throat, it was impossible to differentiate between the smoker and the

nonsmoker. Although in this series of cases there was no incompatability between the smoking of cigarets and the normal, physiological pH values for the throat, it is conceivable that a tobacco-sensitive or tobacco-allergic person, or one with an acutely inflamed throat might show alterations in the pH range.

The effect of smoking two, and even three, dissimilar cigarets within a prescribed period—at a rate faster than most persons smoke—indicated no abnormal alteration of the normal, physiological pH of the throat. Apparently, the cumulative effect on the pH of several cigarets was no different than the effect produced by the smoking of a single cigaret. The smoking of a glycerin-treated cigaret did not disturb the normal, physiological pH range of the mucous membrane of the throat. A comparison of the effect of the glycerin-treated cigaret with that of the diethylene glycol-treated cigaret failed to show any difference between them. Further, there was no difference between the cigaret treated with diethylene glycol and the cigaret devoid of a hygroscopic agent, nor was there any difference between the effect of the glycerin-treated cigaret and that of the cigaret without a hygroscopic agent with respect to the normal, physiological pH of the human throat.

It cannot be stated that the type of hygroscopic agent used in the manufacture of various brands of cigarets influences the irritating properties.

Williams, A. C., and Guralnick, W. C.: The Diagnosis and Treatment of Ludwig's Angina. *N. England J. M.*, 1943, 228: 443.

The authors present a report of 20 consecutive cases of Ludwig's angina with a mortality rate of 10 per cent, as compared to 54 per cent in their earlier series of 31 cases.

The authors consider the essential diagnostic criteria as being anatomical as well as clinical.

Anatomically, there must be inflammatory involvement of both the sublingual and submaxillary spaces. The involvement of the sublingual space is indicated by edema, induration, tenderness, and elevation of the floor of the mouth, the mucosa of which is usually flecked with a dirty gray-white exudate; also, the tongue usually shows varying degrees of edema, so extensive in some cases that it reaches several times its original size and fills the oral cavity. Submaxillary-space involvement is manifested by a rounded, tense, brawny, tender swelling which is maximum in the region of the submaxillary gland and limited chiefly to the suprahyoid region of the neck. This swelling may be unilateral or bilateral. Fluctuation occurs rarely, and was noted in only 2 per cent of the authors' cases.

Clinically, the patient has difficulty with speech and swallowing. Difficulty in breathing occurs only in extreme cases. Usually there is drooling at the mouth because of the difficulty in swallowing.

In 51 per cent of the authors' previous series of 31 cases, and in 90 per cent of the present series, the etiological factor was some type of dental lesion. A careful pre-extraction and postextraction oral hygiene will greatly reduce the incidence of these lesions. In 2 patients the infection was apparently in the pharynx, since both patients had had sore throats prior to onset of the condition.

Bacteriological studies were made in 16 of the 20 cases here reported. Streptococci were present in all cases and Vincent's organisms were present in 8 cases.

Respiratory obstruction is considered the most imminent and potentially dangerous complication, and tracheotomy, if needed, must be available in all cases.

The aims of treatment are to establish an adequate airway, to relieve tension, to secure drainage, and to combat the infection by supplementary measures. The authors believe that the establishment of an airway is of first importance. In some cases, this may be accomplished by catheterizing the trachea through the nasal or oral cavities, but the procedure is extremely difficult. The authors believe that in every case, prior to incision of the suprahyoid region, the trachea should be exposed as a preliminary measure.

The surgical drainage is made through an incision parallel to and 1.5 cm. below the body of the mandible, beginning 1 cm. in front of the angle of the jaw and extending just beyond the midline anteriorly. The deep cervical fascia, mylohyoid and anterior belly of the digastric muscles are cut through. The submaxillary gland is exposed and removed if it is found to be involved in the septic process, and thus the submaxillary and sublingual spaces are exposed. The use of sulfonamide drugs is strongly recommended as an adjunct to surgery.

The authors prefer procaine as a local anesthetic for the tracheotomy only, and an intravenous injection of barbiturate for the incision and drainage of the abscess. Oxygen may be administered with an intranasal catheter. EARL O. LATIMER, M.D.

NECK

Friedman, H. H.: So-Called "Benign Metastasizing Goiter." Report of 2 Cases with Intracranial Metastasis. *Arch. Surg.*, 1943, 46: 377.

The author briefly reviews the literature on so-called "benign metastasizing goiter" and concludes that in spite of the histologically benign appearance of the primary tumor or the metastases, or of both, the condition should be regarded as malignant.

Clinically these lesions are insidious in onset, and do not present symptoms that are different from those of other tumors of bone.

While the true nature of the lesion usually remains unsuspected until the tumor tissue is examined microscopically, two features of diagnostic importance are the presence of palpable, and often visible, pulsations synchronous with the pulse, and the tendency of the metastases to fluctuate in size during menstruation and pregnancy. Pulsation is

especially common in the cranial metastases, and a bruit is not infrequently audible over the mass; also the metastatic implants may function, with resultant hyperthyroidism. Oddly enough, removal of the primary lesion rarely produces changes in the symptoms, but removal of the secondary growth may cause a relief of the symptoms of hyperthyroidism and even myxedema.

Approximately 38 per cent of bone metastases occur in the cranium, and 15 per cent in the vertebrae. The ratio of women to men with this condition is about 3 to 1. The average age of the patient is from forty to sixty years, and the condition is often of many years' duration.

Treatment should consist of radical surgical removal of the metastatic tissue, if accessible, as well as of the primary tumor. Recurrence is almost universal and is sometimes fatal. Fortunately, recurrences may not occur for several years. Roentgen therapy should be directed to the site of the metastatic implants and to the thyroid gland itself because of the radiosensitiveness of these neoplasms.

The author reports 2 cases of metastases to the cranium. Subsequent to the establishment of the diagnosis, subtotal thyroidectomy was done in each case. In one case definite malignant changes were found in an adenoma; in the other no malignant changes were demonstrated in an adenoma, but the author believes that had serial sections been made, miniature areas of carcinoma would have been found.

EARL O. LATIMER, M.D.

Lahey, F. H.: Goiter Incisions. *Ann. Surg.*, 1943, 117: 332.

The appearance of the operative scar very properly and importantly occupies the mind, not only of nearly every patient, certainly every female patient, but also the mind of nearly every surgeon. If this fact is true of any operation, it is particularly important in the case of goiter incisions. It is refreshing to know that such a capable surgeon as Lahey places a high degree of importance upon the making of incisions.

A detailed account as to the proper placing of the incision with relation to the anatomical structure is given, amply illustrated by many pertinent diagrams and photographs. The deductions drawn from more than 22,000 goiter incisions are presented and include such factors as the necessity of exposure of a sufficient area of skin over the chest and up over the neck as to give good vision of the parts involved.

Lahey prefers to extend the incision through the layers in turn, first cutting through the superficial one-half or two-thirds of the skin, then deepening the incision in its central part down through the subcutaneous fat and platysma. This is then followed on through by means of dissection with scissors, to expose the avascular line of cleavage between the platysma and the prethyroid muscle, and thus avoid the prominent veins adherent to these muscles and the likelihood of severing them, with undue loss of blood.

The lower skin flap is not undermined or mobilized in any way.

Lahey considers a satisfactory goiter incision as one in which the skin flap is elevated to such a level that at least an inch of the superior thyroid artery can be seen beyond the point at which it enters the apex of the thyroid gland. Should a hemorrhage from this artery occur, and the bleeding vessel cannot immediately be seen or clamped, the author does not hesitate to continue upward on the side, expose the external carotid artery, and clamp and ligate the first branch of the superior thyroid artery. This procedure is done with the purpose of saving the patient's life regardless of the appearance of the scar.

Relative to the placing of drains, Lahey considers the extreme angle of the incision as a proper site for drains. Midline stab wounds are definitely avoided. In order to overcome oozing, he resorts to suture of the remaining stump of the thyroid against the trachea, and thus permits closure of the wound without drainage.

The author does not employ subcutaneous suture of the platysma, but approximates the margins of the skin accurately with clips. This does not result in spreading of the scar as may be thought by some surgeons. The clips are put fairly close together to control the skin oozing. It is most important that one-half of the clips are removed on the second day and the other half on the third day. Such procedure avoids pressure necrotic spots which mar the scar with white dots.

It is the opinion of the author that nothing plays a greater part in the happiness of a patient who has been operated upon for goiter than the postoperative appearance of the incision.

STEPHEN A. ZIEMAN, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Burrows, H., Cave, A. J. E., and Parbury, K.: A Roentgenographical Comparison of the Pituitary Fossa in Male and Female Whites and Negroes. *Brit. J. Radiol.*, 1943, 16: 87.

A roentgenographic study was made of 100 adult crania, 50 of which were from African negroes of known locality, and 50 British, from an old (post-medieval) London burial ground. During exposure, each skull was suspended from supports inserted into the external auditory meatuses, and was so orientated that its sagittal plane remained permanently at right angles and in a constant position relative to both the source of x-rays and the film. The distances between the source of x-rays, the cranial sagittal plane, and the photographic film were kept constant. Distortion was therefore minimal, and the outlines obtained were directly comparable as to size and shape. Two kinds of measurements were made: the outlines of the fossae were transferred to stiff paper of uniform thickness, from which silhouettes representing the sagittal pituitary area were cut out and weighed; the antero-posterior length and depth of the fossae were measured directly, the latter dimension being taken as the maximum length obtainable at right angles to the former.

The area of the pituitary fossa as estimated in the sagittal plane was greater in the male (white or black) than in the female, and greater in the European than in the African of corresponding sex.

While the size of the pituitary fossa is no direct index of the bulk or volume of the pituitary gland, the size of the fossa must bear a constant relationship to that of the contained organ. That the estimated pituitary fossa area of males should exceed that of the females is noteworthy, since the reverse was found to obtain in various animal species. Another point of interest is the wide individual variation in size and shape manifested by the pituitary fossa. The destruction by enemy action of the necessary cranial material curtailed the original scope and aims of the article.

HAROLD C. OCHSNER, M.D.

Guttman, S. A.: The Treatment of Postlumbar-Puncture Headache with Ergotamine Tartrate. *Arch. Neur. Psychiat.*, Chic., 1943, 49: 556.

As early as 1927 Targowla and Lamache mentioned the use of ergotamine tartrate in postlumbar-puncture headache, and in 1936 Lennox *et al.* also reported on its use in 7 cases. The present report gives the results of this treatment in 35 patients who had headache following spinal anesthesia (with procaine.) The headache, however, is identical with that following the ordinary diagnostic lumbar puncture.

The dosage of ergotamine tartrate was between .25 to .5 mgm. the amount varying with the individuals—enough was given to relieve the headache without producing the toxic effects of nausea, vomiting, and various vasospastic phenomena. This was usually given intramuscularly, but in dubious or severe cases it was given intravenously. To rule out a possible psychic effect the intravenous injections were given two hours after 1 cc. of normal saline solution was used intravenously. Although one dose often relieved the headache, it was soon deemed advisable to repeat the dose about three times daily for one or two days. One milligram was usually the maximum daily dose.

The results were complete relief in 82 per cent, some relief in 5.7 per cent, and no relief in 11.4 per cent.

The effect was tested by elevating the back rest of the patient to about 50 degrees within from five minutes to two hours following the medication and noting the degree of headache. Following the intravenous injection the headache was usually relieved within from fifteen to thirty minutes.

JACK I. WOOLF, M.D.

Abbott, W. D., Due, F. O., and Nosik, W. A.: Subdural Hematoma and Effusion as a Result of Blast Injuries. *J. Am. M. Ass.*, 1943, 121: 739.

The authors, realizing the inadequacy and paucity of neurological findings in subdural hematomas and effusions, report a series of 10 cases due to blast injuries. In this report they correlate the psychiatric and psychological examination with this condition and point out that the diagnosis of various neuroses and postconcussional states is all too frequent.

On psychiatric examination the subdural cases present one of two syndromes. The most frequent syndrome is one of a dull, retarded nature in which the patient responds slowly and superficially. In such a situation it is difficult to keep the patient's attention, and his attempt to "get by" without mental activity shows an apparent lack of insight into his own condition. The loss of initiative and "push" is in marked contradistinction to the anxious, demanding, and tensive state of the traumatic neurosis and anxiety states.

The less frequent syndrome usually occurs in the chronic cases and is comparable to the organic reaction types. An impairment of restraint and inhibition with a resulting euphoric and facetious air, lack of judgment, and the assuming of unusual liberties in the interpersonal relationship is revealed by the patient. A quickly stimulated rage reaction is evidenced by a vasomotor flushing of the face and an increased neuromuscular tension. Organic defects seen are distractibility, memory failure, perseveration, repetition, and attention to unimportant details. A mild motor aphasia with hesitation on cer-

tain words and repeating test phrases may be present.

In cases revealing the typical syndromes, only gross psychological testing, such as the recall of digits and subtraction of 7's from 100 serially, may suffice. Here it is not the actual result of the tests that is indicative, but rather the patient's reactions as seen by slow response time, lack of concentration, and rage reactions when confronted with failure.

Although studies with the Rorschach test are as yet incomplete, a correlation is brought out in that the dull type of syndrome reveals a reduced productivity and originality rather than a dearth of ideation. The unrestrained type reveals a gross impairment of abstraction.

The Shipley-Hartford retreat test is considered the most useful because the vocabulary test gives an estimation of original intelligence while the abstraction test requires preservation of intelligence. The Shipley test is stated to be more sensitive in pathological involvement of the frontal lobes.

JACK I. WOOLF, M.D.

Weinberger, L. M., and Boshes, B.: Paraphysial Cysts of the Third Ventricle. *Surgery*, 1943, 13: 368.

The authors report a case of paraphysial cyst of the third ventricle and discuss the pathological, diagnostic, and clinical aspects of these tumors. A tabulated review of 17 cases from the literature is also presented.

The authors' patient was a young married woman who gave a history of an acute onset of headaches followed by vomiting. Questioning after operation brought out the fact that the headache was related to alteration in the position of the head. Pain in the neck and radiating down the arms, and double vision occurred. Neurological examination revealed no mental disturbance. There was a palsy of both external recti muscles and some papilledema and retinal hemorrhages. Visual acuity was only slightly diminished and the visual fields were full. Plain roentgenograms of the skull were negative. Bilateral ventriculography was performed with the injection of indigo-carmine dye which showed that the intraventricular foramina on one or both sides were obstructed. The injection of air showed a marked dilatation of both lateral ventricles and failed to visualize the third ventricle. A day later the patient became drowsy, restless, and irrational. The ventricles were tapped several times and operation was performed with a vertical, transcortical incision 2 in. anterior to the rolandic vein. The terminal portion of the chorioid plexus was coagulated and with traction the tumor could be grasped and teased through the foramen into the lateral ventricle. It was about the size of a small cherry and was attached to the portion of the chorioid plexus within the third ventricle. This attachment was coagulated and cut. The patient was discharged twenty-one days after operation, and four months later had recovered except for a slight facial weakness.

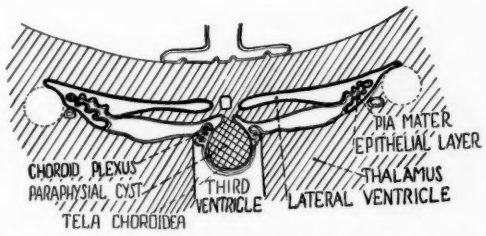

Fig. 1. Adapted with modifications from a figure of Larsell. The formation of the primitive chorioid plexuses is illustrated diagrammatically. A paraphysial cyst has been drawn in. It is shown sagging down upon the tela chorioidea and, in turn, being enveloped by it. As the cyst enlarges and the pedicle thins, the chorioid plexuses of the third ventricle will fuse at the pedicle. The cyst eventually is invested with the two layers of the tela chorioidea which comprises the outer fibrovascular investment.

The anatomical relationships of paraphysial cysts are illustrated in Figure 4. The intimate investment by the tela chorioidea has led to the erroneous conclusion by some writers that these cysts are derived from the chorioid plexus. Since the tumors are exactly in the midline and usually round, both foramina are likely to be blocked equally with resulting symmetrical dilatation of the lateral ventricles. A certain degree of mobility of these pendulous tumors may permit their transient impaction into one or both foramina and produce sudden episodes of intracranial hypertension.

There is no distinctive symptomatology of these tumors. More common than the occurrence of violent headache with alteration in head position is the intermittency of the headaches and vomiting. Diagnosis usually depends upon pneumographic evidence. Less difficulty is encountered in roentgen interpretation if both ventricles are injected with air at the same time. Recovery of indigo-carmine dye from the ventricle opposite to the side of its injection may be possible in the presence of a large tumor. Operation should be undertaken immediately when the ventriculographic diagnosis is made. The most favorable methods to be employed in diagnosis and operation are discussed. JOHN L. LINDQUIST, M.D.

Rand, C. W., and Reeves, D. L.: Dermoid and Epidermoid Tumors (Cholesteatomas) of the Central Nervous System. Report of 23 Cases. *Arch. Surg.*, 1943, 46: 350.

Dermoid and epidermoid tumors (cholesteatomas) of the central nervous system are uncommon, slowly growing neoplasms representing epiblastic inclusions of the dermal and epidermal layers. At present, fewer than 200 epidermoids of the central nervous system have been reported. The intracranial variety is seldom diagnosed preoperatively. The extradural, or diploic, type can be recognized roentgenographically. The series reported includes 23 cases, 11 of which are instances of diploic, or cranial, epidermoid.

The diploic type is easily accessible surgically, and postoperative results are exceptionally good. Sebaceous cysts of the scalp can be distinguished pathologically from epidermoid tumors by the absence of squamous epithelium and of keratohyalin granules, and the presence, instead, of a secreting type of epithelium in the former.

Although complete extirpation of these tumors is necessary to prevent recurrence, this often cannot be accomplished in the cases of intracranial epidermoids because of their extent and attachment to vital structures. The epidermoids of the cerebellopontile angle show signs and symptoms similar to those of acoustic neurinomas, with the exception that there seems to be a greater involvement of the cranial nerves on the affected side.

The use of the words "epidermoid" and "dermoid," suggesting their origin, seems the most satisfactory terminology for these tumors. The term "cholesteatoma" is an unfortunate designation, for the reason that it refers to a chemical by-product which is neither an essential nor an invariable constituent of these tumors.

The cholesteatomatous masses associated with chronic suppurative conditions of the middle ear have generally been considered entirely different lesions. They result from a chronic inflammatory desquamative process and are not neoplastic as are the true dermoids. In contradistinction to the primary or true tumor, this secondary type of cholesteatoma has also been called caseous metamorphosis inflammatory cholesteatoma, and cholesteatosis.

Ordinarily the gross appearance of an epidermoid is so characteristic that a correct pathological diagnosis can be rendered at sight. So striking is the glistening white capsule that it has seldom failed to impress the observer. Often the contents of the epidermoid tend to fragmentation, although caseation and necrotic change may occur in tumors of long standing. The dermoids, on the other hand, are often soft with cystic consistency. Although they frequently have a pearly sheen, their color is more likely to be an opaque yellow. The presence of sebaceous material, fat, and cholesterol crystals in varying proportions determines the consistency of the dermoids, and usually they contain hairs, coiled, clumped, or matted together. It has been considered that the presence of hair may be regarded as pathognomonic of the dermoid or teratoid type of growth. On cross section an epidermoid has a uniform consistency and contains a finely granular, white or creamy yellow material which tends to be laminated. If the section is made in another plane, it has a concentric laminated appearance not unlike that of an onion. The surface of the tumor, moreover, has a soapy or waxy quality. The absence of vascularity is a noteworthy feature of the epidermoids. In most cases a definite point of attachment and a more or less intimate association with the pia-arachnoid are demonstrable. The dermoids are usually much larger than the epidermal tumors, and have a tendency to push into one or the other cerebral hemisphere, especially in the temporal lobe. They are also much more apt to be cystic and are single more frequently than are the epidermoids.

JOSEPH K. NARAT, M.D.

SPINAL CORD AND ITS COVERINGS

Rammelkamp, C. H., and Keefer, C. S.: The Absorption, Excretion, and Toxicity of Penicillin Administered by Intrathecal Injection. *Am. J. M. Sc.*, 1943, 205: 342.

Six subjects, 1 with idiopathic epilepsy, 1 with rheumatoid arthritis, 2 with meningitis, and 2 with brain abscess and meningitis, received intrathecal injections of penicillin. Data are presented concerning the blood and spinal-fluid concentration and the urinary excretion of penicillin after the intrathecal injection of from 3,000 to 10,000 Florey units. In the subjects without meningitis, penicillin was slowly absorbed and slowly excreted in the urine after the injection of from 5,000 and 10,000 Florey units. It was detected in the spinal fluid for thirty-one and one-half hours after the injection of 10,000 Florey units. In 1 of these subjects the injection of 10,000 Florey units was followed by headache, vomiting, increased intrathecal pressure, and phagocytosis in the spinal fluid. After the injection of 5,000 units the only symptoms noted were a slight headache and a slight increase in the number of leucocytes in the spinal fluid. In the patients with meningitis, absorption was more rapid and a greater amount of the administered dose was excreted in the urine. Penicillin was detected in the spinal fluid twenty-four hours after the injection of the antibiotic agent. In the 2 patients who died, penicillin was demonstrated in the cerebrospinal fluid removed from the third ventricle and from the cisterna magna. In the patients with meningitis no untoward symptoms were noted after the injection of from 3,000 to 10,000 Florey units.

The authors suggest that the intrathecal injection of penicillin may be effective in the treatment of meningitis due to streptococci, pneumococci, and staphylococci since an effective local concentration of the active substance can be maintained for a period of about twenty-four hours without undue toxic reactions. In general, the initial dose should not exceed 10,000 Florey units and subsequent doses of 5,000 units may be injected at intervals of from twenty to twenty-four hours. If bacteremia is present it would be well to administer penicillin intravenously as well as intrathecally.

WALTER H. NADLER, M.D.

Craig, R. L.: A Case of Epidermoid Tumor of the Spinal Cord. *Surgery*, 1943, 13: 354.

A case of epidermoid tumor of the spinal cord is reported in detail, and the literature of epidermoid and dermoid tumors of the vertebral canal is reviewed. The author's patient was a twenty-five-year-old white male who was admitted to the hospital with a tentative diagnosis of spinal-cord tumor. Both

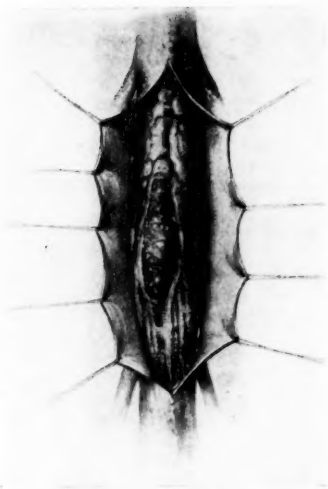

Fig. 1. Drawing of operative field after retraction of the dura. The main body of the tumor lies in the conus, covered only by a thin membrane of pia-arachnoid.

legs were slightly spastic and sensory examination revealed a fairly sharp level at the eleventh thoracic dermatome bilaterally. He had had some symptoms referable to his lesion since early childhood, and roentgenograms showed a spina bifida of the first sacral segment.

At operation the upper pole of the tumor was at the level of the eleventh thoracic vertebra or at the third or fourth lumbar segment of the cord (Fig. 1). The cutaneous sensory loss above the third lumbar segment must have been due either to compression of the nerve roots or to the arachnoiditis which was present. Practically the entire dorsal surface of the tumor was exposed, being covered only by the pia-arachnoid. The tumor is, therefore, classified as subpial rather than intramedullary. Histological examination of the tumor showed the basement epithelial membrane to be thrown up into innumerable folds, which probably accounted for the unsatisfactory surgical result obtained.

On the basis of the previous review of Boldrey and Elvidge on dermoid and epidermoid tumors, the author eliminates doubtful cases and adds others so that he believes 43 cases of this type of tumor have been reported. Twenty of these are probably epidermoids and 23 dermoids. He discusses these two types of tumors separately. In the case of epidermoids sterile inflammatory reactions such as meningitis and transverse myelitis occasionally occur. There is some evidence that these reactions are due to the formation of fatty acids which are liberated into the subarachnoid space. Dermoid tumors are occasionally associated with congenital dermal (pilonidal) sinuses. Obstruction of such a sinus may result in sudden exacerbation of pressure symptoms. Infection reaching the meninges via these sinuses may give rise to septic meningitis or localized subdural abscess. JOHN L. LINDQUIST, M.D.

PERIPHERAL NERVES

Bodian, D.: Repair of Traumatic Gaps in Nerves. *J. Am. M. Ass.*, 1943, 121: 662.

Bodian describes a new method for the closure of irreducible traumatic nerve gaps, in a single operation. He has performed his operation on monkeys. The postoperative observation period has been only five or six months, and although he has noticed some return of muscular movement the degree of recovery finally attainable remains to be determined.

The stumps of the injured nerve are freed from scar tissue and the ends prepared as for end-to-end suture. After mobilization of the stumps as much as possible, a cylindrical segment of the distal stump, embodying the nerve sheath and the underlying outer bundles of nerve fibers, and somewhat longer than the gap to be bridged, is prepared and moved proximally into apposition with the central stump. The sleevelike extension from the peripheral stump can be prepared in two ways. It can sometimes be freed distally by a circular incision in the peripheral stump which severs only the outer nerve sheath and peripheral bundles, and then pulled proximally along the central core of the distal stump (Figs. 1 and 2). When the inner sheaths of the nerve offer too much resistance to such a sliding sleeve extension, the sleevelike extension can be dissected free from the inner core of the nerve bundles, following the line of incision shown in Figure 3, and moved proximally into apposition with the central stump as shown in

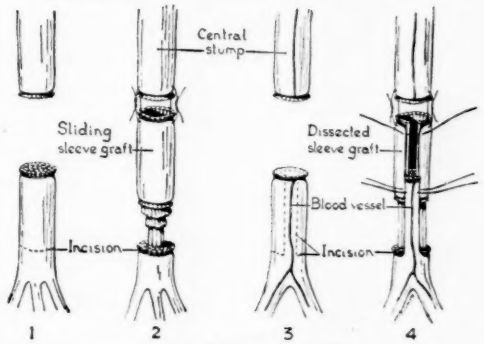

Fig. 1. 1. Large peripheral nerve with traumatic gap irreducible by tension, rerouting, or postural shortening. 2. Same with gap closed by means of sliding-sleeve extension from distal stump. 3. Nerve with gap, showing line of incision for preparation of dissected-sleeve extension. 4. Gap shown in 3 closed by means of dissected-sleeve extension. Both types of operation are completed by contact approximation of the sleeve graft with the central stump and the placing of additional sutures through the sheaths at the plane of junction, as in end-to-end suture.

Figure 4. With this procedure it is possible to avoid severing the main blood vessel in the sheath of the peripheral stump.

With the sliding-sleeve extension sutures need be placed only at the line of apposition with the central stump in the manner of end-to-end suture. In the case of dissected-sleeve extension sutures are placed as shown in Figure 4. Fixation of the core of the distal stump is obtained by suturing sheaths only, if the dissected sleeve has been sufficiently long.

The advantages of the sleeve extension methods are: (1) uncomfortable postures of the limbs, as in nerve-stretching operations, are avoided; (2) no other nerve is deprived of function, as in the case of nerve crossing or nerve autotransplant; (3) the repair procedure is confined to the site of injury of the nerve; (4) except for the junction with the central stump, there is no place where invading fibrous tissue can form a transverse barrier to outgrowing nerve fibers; and (5) excessive fibrous tissue is not incorporated into the interior of the repaired segment of nerve. DAVID J. IMPASTATO, M.D.

SYMPATHETIC NERVES

Shumacker, H. B., Jr.: A Case of Livedo Reticularis and Vasospasm Treated by Sympathectomy, with Some Notes on Sympathetic Anesthesia in Labor. *Surgery*, 1943, 13: 257.

This is an extremely interesting case report of a rare disease in which the treatment of the disease led to incidental matters of considerable interest—livedo reticularis. The disease is probably essentially a disproportion in size between various sets of capillaries supplied by small arteries. The arteries are further interfered with through vasospasm with increased stagnation of the blood flow in certain areas. This brings about discoloration in annular rings around central pale areas in the skin. This discoloration is further intensified by exposure to cold (Fig. 1).

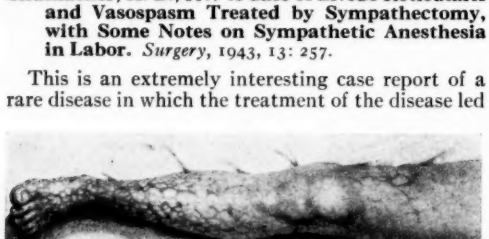

Fig. 1. Photograph of a water color of the patient's right lower extremity.

In the particular case which was reported in detail, temperature and other studies were made. The impression was that the patient had severe vasospasm in both lower extremities. Lumbar sympathectomy was done on both sides. Following this, the feet remained warm and dry and the skin was normal except for a very slight suggestion of mottling, which disappeared when the patient lay down.

The sympathectomies were performed in the summer of 1940, and the patient had her first child in August, 1941. She was admitted to the hospital, labor progressed rapidly, and she was delivered spontaneously of a normal child. She stated that she had no pain at all with uterine contractions up to the time of expulsion of the infant. This statement caused the author to become extremely interested in the mechanism of pain from the uterus. The course of the afferent pain fibers from the uterus is not fully understood, although it is presumed that the great majority of fibers pass through the sympathetic chains through the hypogastric plexus and enter the cord at fairly high levels. On account of this condition, the author attempted to inject the lumbar sympathetic nerves so as to produce an anesthesia of them during labor, but he does not believe that he has made a sufficient number of injections to make any statement with regard to whether they are of any value in dealing with the pains of labor. There are many problems connected with this particular point which should be investigated before this method is used in alleviating pain of labor. ADRIEN VERBRUGGHEN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Weinshel, L. R., and Demakopoulos, N.: Supernumerary Breasts, with Special Reference to the Pseudomamma Type. *Am. J. Surg.*, 1943, 60: 76.

Congenital supernumerary breasts are not uncommon, but a supernumerary breast of the pseudomamma type, as classified by Kajava, is a relatively rare phenomenon. This statement is further substantiated by Deaver and McFarland, especially so if the supernumerary breast is found in the inguinal region, for, in reviewing over 10,000 cases of polymastia, they found only 12 in which this anomaly occurred in the inguinal region.

Traced from its embryonal origin, the human breast arises from an epidermal ridge or primitive "milk line," which extends between the upper and lower limb buds on either side of the midline. In the second month of intrauterine life, breast anlage appear. These breast anlage appear in the embryos of all mammals, to be developed or suppressed according to phylogenesis. In man the anlage appear in the form of an evagination on each side in the pectoral region at the site of the normal breast, and the remaining anlage are suppressed and disappear. When suppression of any of the rudimentary anlage fails, and when the so-called "milk spots" develop unduly, supernumerary breasts appear at different points along the course of the epidermal ridge.

Campney believes that supernumerary mammary glands are enlarged sweat glands and not true breasts, a theory which was supported by Tandlaus' observation of a patient in whom there was complete failure of development of the breast and nipple, together with total absence of sweat glands all over the body, and partial absence of the sebaceous glands.

Complete supernumerary breasts are exceptional. Usually supernumerary breasts appear as polythelia or pseudomamma. Kajava classified congenital supernumerary breasts as shown in a table in the original article.

Supernumerary mammary glands, or polymastia, and supernumerary nipples, or polythelia, are said to occur rather more frequently in the male than in the female.

Deaver and McFarland compiled a series of cases of atypical locations of supernumerary breasts, and among those noted were 12 cases of pubic and inguinal accessory mammae. Four of these cases occurred in males, 6 in females, and 2 in cases of unknown sex. The authors report in detail a case of an extremely large supernumerary breast of the pseudomamma type, located in the left inguinal region of an otherwise normal, colored, adult male. In reviewing the literature, they found such little mention of this type of congenital anomaly that they included this case together with those reported by Deaver and McFarland, in which supernumerary breasts occurred in the inguinal region of the male. This case, in the authors' opinion, was truly a case of congenital supernumerary breast, pseudomammatous in type, as classified by Kajava. A normal colored male at the age of puberty developed this abnormal breast. Grossly it resembled a female breast having a fully developed nipple, areola, and what appeared to be glandular tissue on palpation, except for a somewhat firmer consistency. Only the microscopic examination revealed the true condition; namely, a replacement of the glandular tissue by fatty tissue.

The harmless existence of the supernumerary breast requires no medical or surgical treatment. It is only when the accessory breast has an abnormal discharge or location that surgical removal may be requested by the patient. In the authors' case, the unusual size of the breast and its resemblance to a normal female breast caused him no end of embarrassment. Thus, for cosmetic and psychological reasons it was deemed best to remove the breast.

This case, so far as the authors were able to ascertain by a review of the literature, constitutes the fifth case of reported supernumerary breasts in the inguinal region of the male. The article contains a classification table, photographs of the supernumerary inguinal breast before, and after operation, and a comprehensive bibliography.

JOHN E. KIRKPATRICK, M.D.

TRACHEA, LUNGS, AND PLEURA

Gartside, V. O. B.: Agenesis of the Lung. *Brit. J. Radiol.*, 1943, 16: 69.

Agenesis of the lung has been infrequently reported. Thirty-seven cases have been found in the readily available literature and 1 case is reported by the authors. Of the 37 cases reported 3 occurred in stillborn infants; in the remaining cases some infants died—6 in less than a week, 13 in less than six months, and 1 in five years—while 14 lived for periods varying from five to seventy-two years. Absence of the left lung occurred in 23 of the 37 cases.

The most common physical findings were flattening of the affected side, scoliosis, displacement of the apical impulse, and absence of breath sounds on the affected side. X-rays revealed a massive opacity on the involved side. Post-mortem examinations showed one of two pictures: first, either the bronchus ends in a blind sac, or, second, a rudiment of lung tissue which may or may not have been aerated during life.

The author's case was a seven-year-old boy who had a swelling in the neck, and who gave a history of having had colds in his chest. He reacted quite as a normal child. On examination physical and mental

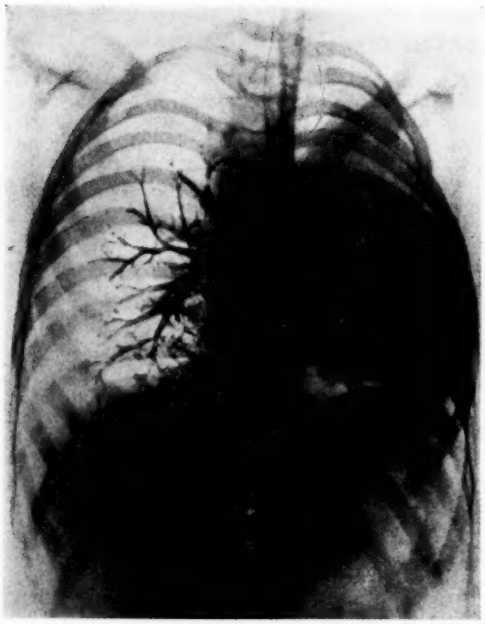

Fig. 1. Bronchogram from which it was possible to make a diagnosis of agenesis of the left lung.

development was normal. There was a walnut-sized swelling in the left supraclavicular triangle which was caused by a cervical rib. Examination of the chest showed marked impairment on percussion with diminished to absent breath sounds and deviation of the apex beat outside of the nipple line in the fourth space. There was a systolic thrill and a loud harsh systolic murmur at the base. The right lung field was clear and the left opaque on x-ray examination. There was some suggestion of aeration at the left base. This was brought out quite definitely by a bronchogram. X-rays of the cervical spine showed multiple anomalies. An electrocardiogram revealed Lead III to be similar to Lead I viewed upside down. A diagnosis of agenesis of the left lung with congenital anomaly of the cervical spine and alteration of the electrocardiogram was made. WILLIAM E. ADAMS, M.D.

Harrison, A. W., and Berry, F. B.: Analysis of 150 Cases of Thoracoplasty for Tuberculosis at Bellevue Hospital. *J. Thorac. Surg.*, 1943, 12: 292.

The immediate results of thoracoplasty in 150 cases of pulmonary tuberculosis with and without tuberculous empyema are presented. Four hundred and thirty operations performed by 14 surgeons form the basis for this report.

The hospital stay following the collapse was less than two months in 28 per cent and only 15 per cent remained longer than six months. The cases were divided into two groups (1) pulmonary tuberculosis (107), and (2) tuberculous empyema (49). Of the former group 74.7 became closed, 25.5 per cent remained open, and 4.7 per cent ended fatally; in the latter group of 49 cases 63.2 per cent became closed, 29 per cent remained opened, and 7.8 per cent ended fatally. Of the patients with empyema 31 per cent had bronchial pleural fistulas and 50 per cent had mixed tuberculous and pyogenic infections. On the whole more operative stages were necessary for the empyema group.

Complications of the operations consisted of spread of the disease in 16 patients (10.7 per cent), which accounted for 2 of the deaths in the series, and wound infection in 4 patients in the first group of whom 3 died of parenchymal disease, and in 13 patients (34.2 per cent) of the empyema series.

Of the 8 deaths in the entire series only 4 occurred in the two-month period. WILLIAM E. ADAMS, M.D.

HEART AND PERICARDIUM

Jager, B. V., and Ransmeier, J. C.: Constrictive Pericarditis Due to Bacterium Tularense. Report of a Case and Review of Reported Cases of Pericarditis Occurring with Tularemia. *Bull. Johns Hopkins Hosp.*, 1943, 72: 166.

Constrictive pericarditis due to the bacterium tularense has been infrequently reported. Involvement of the pericardium by this condition is a very unusual complication in spite of the fact that the lungs and pleura are frequently infected.

The authors report on a twenty-two-year-old white male who developed a chronic febrile condition, the signs and symptoms early suggesting infection of the lungs and pleura. Within a short time dyspnea on exertion was evident and on admission to the hospital both pericardial and pleural effusions were found. His serum agglutinated the bacterium tularense to a dilution of 1 to 160. Pericardial tap revealed fluid and on the injection of air a greatly thickened pericardium was seen. Bilateral pleural effusion was present. By the end of the fifth month of illness the antitularense titer of the patient's serum was 1 to 1,280. Following a transfusion from a patient convalescing from tularemia there was definite clinical involvement. The patient was discharged from the hospital, at which time the bacterium tularense was found in the pleural fluid by direct culture. No tubercle bacilli could be found. Identification of the organism in the left pleural cavity was made by subcutaneous injection of a guinea pig and culture on 3 blood-dextrose-cystine agar slants.

The pleura is the serous membrane most frequently involved in this condition because of the frequency of tularemic pneumonia. Peritonitis as well as meningitis has been reported.

Only 5 or possibly 6 cases of pericardial involvement were found reported in the literature and from personal communications the authors knew of 3

additional cases. In most of these 9 cases the involvement was an acute process, although in the authors' personal case it was chronic. In 8 of the 9 cases pericarditis was accompanied by pneumonia and 4 of the cases terminated fatally. Pericardial friction rub was noted in 8 of the cases and in 6 of the 10 there was cardiac embarrassment.

WILLIAM E. ADAMS, M.D

Donaldson, J. K.: Surgical Approach for Incision and Drainage of Nonpurulent and Purulent Pericardial Effusions. *J. Thorac. Surg.*, 1943, 12: 209.

This article offers some evidence that there should be a reconsideration of generally accepted views that open incision into the pericardial cavity for nonpurulent effusions is always contraindicated. Reports are presented on 4 patients (6 operations) suffering from serious cardiac tamponade due to nonpurulent effusions who were relieved by open incision without the occurrence of secondary infection within the pericardial cavity.

The surgical approach described for nonpurulent effusions is simply a modification of Larrey's costoxiphoid-angle approach, based on Baker and Rives' conception of the anatomy of diaphragmatic attachments. The method can be carried out under local anesthesia in adults, and valvular closure of structures of the abdominal wall should offer as little opportunity for secondary infection in the pericardial cavity as pericardicentesis. One case of recovery from pneumococcic pericarditis and septicemia is reported. The surgical approach used was the "low anterior" with resection of the left costal cartilage. J. M. MORA, M.D.

ESOPHAGUS AND MEDIASTINUM

Work, W. P.: Mediastinal Emphysema and Bilateral Simultaneous Pneumothorax Complicating Tracheotomy in an Adult. *Arch. Otolar.*, Chic., 1943, 37: 526.

This article contains a review of the literature on emphysema with special emphasis on the mode of production. In the case presented mediastinal emphysema and simultaneous bilateral pneumothorax occurred during the course of a tracheotomy. Nine hundred cubic centimeters of air were removed from one side of the chest and 600 cc. from the other by the use of the therapeutic pneumothorax apparatus. Recovery was dramatic and permanent.

The various paths the air may follow either after the overdistention of the lung or after the introduction of air directly into the mediastium are pointed out. JOHN F. DELPH, M.D.

Carlson, H. A.: Congenital Cysts of the Mediastinum. *J. Thorac. Surg.*, 1943, 12: 376.

Mediastinal cysts may be congenital, inflammatory, parasitic, or of undetermined origin. Congenital cysts known to occur in the mediastinum include the following:

1. Epidermoid cysts—derived from ectoderm
2. Dermoid cysts—derived from ectoderm and mesoderm
3. Teratomas—derived from all three primitive germinal layers
4. Cystic lymphangiomas—derived from mesoderm
5. Pericardial coelomic cysts—derived from mesoderm
6. Bronchial (bronchogenic) cysts—derived from entoderm and mesoderm
7. Gastric (gastrogenic) cysts—derived from entoderm and mesoderm
8. Enteric cysts (enterocystom)—derived from entoderm and mesoderm

Epidermoid cysts, dermoid cysts, and teratomas are not sharply demarcated, and as they all contain tissue derived from ectoderm, there has been a tendency to include this group under one term—dermoid or teratoma. These cysts or tumors usually occur in the anterior mediastinum, whence they may protrude laterally and posteriorly, to occupy a major portion of either thoracic cavity, or they may extend from the superior mediastinum into the base of the neck. A typical cyst is lined by stratified squamous epithelium, and contains hair and sebaceous material. The mass may contain calcifications, cartilage, bone, teeth, muscle, glands, and other complex structures. Some teratomas are malignant.

According to the bigerminal theory of the genesis of teratomas, a secondary anlage develops in the body, either through the fertilization of a polar body or the independent development of a blastomere. The monogerminal hypothesis assumes that there is an abnormal separation or segmentation and inclusion of cells, the morphological differentiation of which depends on the stage in the embryo in which the separation occurs.

One of the important clinical features of teratomas is the absence of symptoms over a period of many years, while the cyst is undergoing progressive growth and expansion. As a rule, symptoms develop first between the ages of twenty and forty years. Pain, cough, and dyspnea are most frequent. Occasionally, there is expectoration of hair, blood or other material from the cyst.

Cystic lymphangiomas are among the less common of the mediastinal cysts, and are characterized by the formation of multiple cysts. They may be derived from a portion of the anlage for vessel formation drawn down from the region of the gill clefts by the pericardium in its descent. A thymic origin for these cysts has also been considered a possibility. The symptoms are not pathognomonic, but the onset of symptoms is probably earlier than in teratomas.

Pericardial coelomic cysts are simple, thin-walled cysts. They may develop from one of the several primitive pericardial lacunae. One of the lacunae fails to merge with the others, persists, develops into an independent cavity, and forms a cyst.

Ciliated columnar respiratory epithelial cysts, known as bronchial or bronchogenic cysts, may con-

tain all of the tissues found normally in the bronchial wall. They are cysts of the posterior mediastinum or the posterior portion of the superior mediastinum, and usually occur in the neighborhood of the bifurcation of the trachea. As a rule, the lumen of the cyst does not communicate with the bronchi or trachea. Most of the cysts described measured 5 cm. or less in diameter, and contained 50 cc. or less of clear, viscid, mucoid fluid. The genesis of these cysts has been explained on the basis of a pinching-off of a diverticulum of entoderm and mesoderm from the foregut in the region of the tracheal bud, a secondary budding of the tracheal bud itself, or an abnormal division of the tracheal bud in a later stage of development of the tracheobronchial tree. Another theory assumes an imperfect closure, during fetal life, of the communication between the trachea and esophagus.

Bronchial cysts, by obstructing the air passages, may produce symptoms early in life, before the cyst has attained great size. Occasionally, the cyst may remain asymptomatic throughout life. Dyspnea is the most common symptom, and may be associated with cyanosis. Frequently, the infant presents evidence of dysphagia. Cough is a common symptom, and atelectasis and pneumonia may supervene.

Gastric cysts reproduce the structure of the stomach wall. They vary greatly in size. They are situated posteriorly in the mediastinum, behind the root of the lung, and are adherent to the lung and mediastinal structures. Their genesis has been ascribed to the pinching-off of a bud or diverticulum of the embryonic foregut, to an entodermal epithelial germ cell of the esophagus capable of producing gastric mucosa, or to an intrathoracic vestige of the ductus omphalomesentericus. Dyspnea, cyanosis, cough, and dysphagia are the prominent symptoms occurring during the first few weeks or months of life. Respiratory infections are frequent complications. Since the cyst may early attain a substantial size, physical signs may aid in the diagnosis. Dullness or flatness, and decrease of the breath sounds, usually on one side posteriorly, suggest the presence of fluid.

Cysts resembling gastric cysts, except that they are lined by intestinal mucosa, have been reported under the term "enterocystom." The pathogenesis of enteric cysts has been explained by two theories: that they arise from the foregut, or that they represent rudimentary segments of the thoracic portion of the omphalomesenteric duct. The 4 or 5 cases hitherto reported all occurred in infants, and were found at autopsy.

In the surgical management of teratomas, exteriorization and drainage of the cyst should be avoided. The ideal operation consists of complete transpleural removal of the tumor in one stage. Closure without drainage is preferable. The fluid that accumulates postoperatively is removed by repeated aspirations. When infection is feared at the time of operation, closed intercostal drainage through a separate stab wound is recommended by the author.

Three cases—a teratoma, a bronchial cyst, and a cyst of the gastric type (which was somewhat atypical)—are reported. SAMUEL KAHN, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Jorge, J. M., Feldman, L., and Iturrioz, T.: Mixed Inguinoscrotal Hernia of the Stomach (Hernia inguinoescrotal mixta del estómago). *Sem. méd.*, B. Air., 1943, 50: 301.

Cases of inguinal hernia containing the stomach are rare. The authors have found only 22 cases in the literature and add 1 of their own which makes a total of 23.

Their patient, a man of sixty-six years, had a double inguinoscrotal hernia, the smaller part of which was of the size of a fist on the left side and contained the sigmoid loop of the colon, while the extremely large sac on the right side measured 37 cm. in height by 27 cm. in width and contained part of the small intestine, the cecum, appendix, ascending colon, three-fourths of the transverse colon, and a large part of the stomach and duodenum. The cardia and the greater part of the tuberosity of the stomach were in normal position. The reason for calling this a mixed hernia is that it contained only part of the stomach and also other viscera.

It is a remarkable fact that such enormous hernias can exist without causing any gastrointestinal disturbance. This patient had noticed progressive increase of the size of the hernia since its first appearance eighteen years before, but it had never caused him any trouble, in spite of the fact that he did work which kept him on his feet about fifteen or sixteen hours a day.

The importance of roentgen examination in these enormous hernias is emphasized. It is the only way of determining what viscera are contained in them. Roentgenograms and anatomical drawings of the position of the organs in this case are given. The hernia on the right side had been operated on eight years before, in 1932, but had been only partially reduced, and after this operation the hernia on the left side occurred.

The left hernia was operated on September 7, 1940, and completely reduced. The patient was readmitted September 14, 1941, for operation on the large right hernia but he contracted bronchopneumonia and died before the operation could be performed. Autopsy showed the site of the viscera.

AUDREY G. MORGAN, M.D.

Edwards, H., and Stewart, W.: Hernia Through the Foramen of Winslow, Emerging through the Gastrohepatic Omentum. *Brit. M. J.*, 1943, 1: 343.

Hernia through the foramen of Winslow into the lesser sac is one of the more uncommon abdominal surgical conditions, and the re-entry of the herniated bowel back into the general abdominal cavity through the lesser omentum appears to be still more rare. The transverse colon probably acts as a barrier to herniation. The anterior and posterior boundaries of the foramen during life are in direct contact, and the opening is a slitlike passage.

A fifth case of this unusual type of herniation is described. Three abnormal features were present in the abdominal cavity: (1) a well developed hepatoduodenal fold which produced a funnel-shaped approach to the lesser sac; (2) a dilated foramen of Winslow; and (3) an undue length of mesentery of the small bowel.

The clinical picture was that of generalized peritonitis of short duration in a man, twenty-six years of age. At operation the abdomen contained much bloodstained fluid, and in the right upper quadrant, below the liver, a large mass of hemorrhagic small bowel. The bowel was seen to pass through the foramen of Winslow, which easily admitted one finger. The patient died on the operating table.

At the post-mortem examination the abdomen was found to be extremely distended. The abdominal cavity contained much bloodstained fluid, and lying under the liver were loops of strangulated small intestine which had passed through the foramen of Winslow and then re-entered the general abdominal cavity through an opening in the lesser omentum. The site of strangulation was seen to be at the opening in the omentum and not at the margins of the foramen. The bowel involved in the strangulation was the lower ileum, except the terminal 12 inches, and it measured 6 feet.

ERNEST E. ARNHEIM, M.D.

Sahler, O. D., and Hampton, A. O.: Bleeding in Hiatus Hernia. *Am. J. Roentg.*, 1943, 49: 433.

Two hundred and twenty-one cases of hiatus hernia seen at the Massachusetts General Hospital in a ten-year period were studied. Two important points were brought out:

1. Hemorrhage may be a symptom of hernia.
2. The incidence of hiatus hernia is higher than has been appreciated. The authors believe that many more cases of hernia were actually seen in this period, but that the finding was disregarded in many instances. Recently they examined 100 patients and found hiatus hernia in 9, of whom 6 were female, and 3 male. The average age of the entire group was forty-three and five-tenths years, and of the patients with hernia, forty-five and three-tenths years.

Hiatus hernias are better demonstrated in the horizontal position than in the upright. At the Massachusetts General Hospital all patients are examined in the prone, supine, and standing position; the Trendelenburg position is also of value. If the patient is turned in the left anterior oblique position the esophagus is seen to enter at the right anterior margin of the herniated fundus, which presents a dumbbell, or inverted molar-tooth, shape.

Thirty-two of the series of 221 patients with hiatus hernia had either moderately marked anemia or a positive history of gastrointestinal tract bleeding. When present, bleeding may be due to the hernia, and may be produced by constriction, with congestion of the blood vessels in the herniated portion of the stomach, with a resultant change in the mucosa, and gastritis or ulceration.

HAROLD C. OCHSNER, M.D.

Lavender, H.: Consideration of the Factors Influencing the Surgical Repair of Inguinal Hernia. *Surgery*, 1943, 13: 535.

A brief but interesting review of highlights in the history of hernioplasty and mention of the more important contributions to this field of surgery introduces the reader to a discussion of the many factors which affect the results following surgical treatment of inguinal hernia.

The author reviews the fundamental principles of hernia surgery and urges proper application of these principles rather than development of special techniques in attempting to lower the incidence of recurrence. The two major principles in the repair of an inguinal hernia are: (1) high ligation and excision of the sac, and (2) plastic reconstruction of the inguinal canal. At operation the size of the hernia, its exact type and nature, and the presence of other associated hernias must be determined before intelligent treatment can be carried out. The choice of reconstructive procedure should not be a routine but should be modified by the variations in anatomical strength and development of the supporting tissues to be utilized in the repair. Any weakness or separation of the transversalis fascia must be repaired or replaced. This may be accomplished in many instances by interrupted or plicating sutures. In others, in which the weakness is a large one, fascial substitutes may be required.

Whether or not one transplants the spermatic cord should depend upon the problem involved and not upon a routine. When there is a well defined defect over Hesselbach's triangle an additional support is required and is met best by transplanting the cord and thus permitting suture of fascia to fascia in this region. In indirect hernia, in which the weakness is at the internal inguinal ring, the defect may be reinforced by drawing together the fibers of the transversalis fascia about it without need for transplantation of the cord. In many instances both types of reinforcement will be necessary.

The value of nonabsorbable suture material has been well established by many independent investigators and until the ideal suture is discovered this material will enjoy preference for a strong plastic union in a clean wound.

The choice of anesthetic is immaterial as long as it permits good relaxation and accurate anatomical repair.

The proper preoperative and postoperative care of hernia patients is a major factor contributing to the end-results in this as well as in any other field of surgery. Except for cases of strangulation, hernia operations are elective procedures. Obesity should be minimized and nutritional deficiencies corrected before operation to permit optimum healing of the structures involved. Patients should not be allowed to get up until sufficient time has elapsed to permit complete healing of the wounds.

This essay is concluded by a statistical review of 100 operations for inguinal hernia in 74 male laborers who returned for follow-up examinations for one year or more. There were 84 modified Bassini operations and 16 Halsted procedures. Two recurrences followed the Bassini procedure. There was 1 wound infection and there were 4 cases of postoperative pulmonary complications. Spinal anesthesia was used for 50 patients and inhalation anesthesia for 24. Nonabsorbable sutures were used in all cases.

EDWARD W. GIBBS, M.D.

Iason, A. H.: Fascia-Lata Transplant for Difficult Hernias. *Surgery*, 1943, 13: 511.

The author believes that the use of living fascia in the repair of large hernias is of more value than that of all other forms of suture material. When extreme relaxation of the inguinal canal floor is present with loss of support in the inguinal triangle, consequent upon the inadequacy of the transversalis fascia from one cause or another, the utilization of fascia-lata transplants for deep reconstructive repair has unparalleled values.

Fascia-lata transplants, or any other variety of transplants, should not be used indiscriminately. When the fascia transversalis has not lost its prime function, the use of these transplants is an unsound surgical procedure.

The paramount advantages of the utilization of fascia-lata transplants, stated succinctly, are as follows:

1. Fascia-lata transplantation has a definite role in the repair of abdominal wall defects.
2. In direct and pantaloon hernias, with the high incidence of recurrence, it rarely fails.
3. In hernias of the older group, of men and women past fifty years of age, it promises cures.
4. In the repair of "sliding hernias" (a problem in the past), it offers a solution.
5. Despite wound infection, the results are excellent.
6. No disturbances of locomotion ensue.
7. Recurrences are rare.

The indications for the utilization of fascia-lata transplants are:

1. Hernias difficult to repair by the customary surgical methods
2. Large or massive inguinal hernias, complete or incomplete, direct or indirect, with a structural defect in Hesselbach's triangle, and musculature and aponeuroses which have lost their myodynamic integrity
3. Recurrent hernias with large defects in Hesselbach's triangle
4. Large or massive incisional hernias

The author's technique utilizes a strip of fascia 3 in. wide and from 2 to 4 in. long. The pedicled fascial strip is then carried to the inguinal ligament subcutaneously. A slit is made in the inguinal ligament through which the fascial transplant is drawn. Three sutures anchor the transplant. The free end of the transplant is then sutured to the conjoined tendon and to the inferior aspect of the external oblique aponeurosis by No. 1 interrupted chromic catgut strands placed at intervals of about ¾ in. The medial angle of the free edge of the pedicle is sutured sufficiently far medially so that it impinges upon the rectus abdominis muscle; the lateral edge of the free border of the fascial transplant must be sutured far enough to impinge upon the deep inguinal ring. The medial border of the fascial transplant above the inguinal ligament is then sutured to the superior aspect of the lacunar ligament to prevent herniation. A single suture is then placed, to approximate the middle section of the transplant above the inguinal ligament to the underlying transversalis fascia. The lower free border of the external oblique aponeurosis is finally sutured to the upper free margin, which places the spermatic cord subcutaneously. STEPHEN A. ZIEMAN, M.D.

Mathé, C. P.: Retroperitoneal Suppuration Complicating Operations on the Kidney, Prostate, and Bladder. *J. Urol.*, Balt., 1943, 49: 382.

The two types of retroperitoneal postoperative suppuration following genitourinary surgery are: (1) the anaerobic type of fulminating proportions, and (2) the more chronic infections requiring less heroic care. The author reports a series of 8 such cases and discusses the treatment used in each.

The signs and symptoms can be divided into two groups: (1) general, and (2) local. The general picture is one of a seriously ill patient with a persistent temperature rise which is often preceded by a chill. Leucocytosis and other subjective signs of internal suppuration are present. The patient infected with anaerobic organisms rapidly passes into shock which often is terminated by death. The chronic infections are more gradual in appearance and pursue a less violent course. The presence of tympanites must not be interpreted as being indicative of a gastrointestinal lesion since this sign is often prominent in these cases.

The local signs are those of tenderness and induration of the infected tissues, along with edema, spasticity, and tenderness in the involved abdominal or lumbar musculature. Anaerobic infections produce crepitation and brawny induration with abdominal rigidity. In retroperitoneal suppuration following prostatectomy the pain is most marked in the lateral areas of the abdomen. If the suppuration dissects the anterior layer of the peritoneum free the process extends to the umbilicus and opens this structure. The accompanying illustration demonstrates the course of the infection. The presence of anaerobic infection develops within from one to five days and a roentgenogram will demonstrate the presence of gas in the tissues. Also, an exploratory

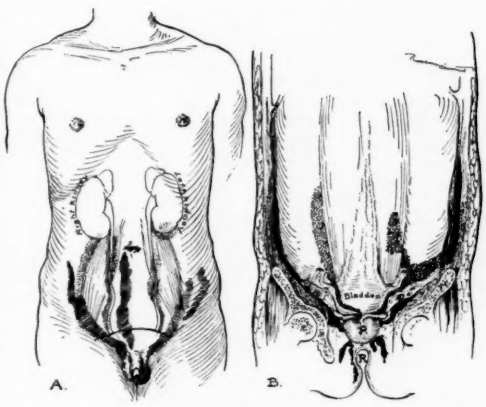

Fig. 1. Left, Showing course of postoperative retroperitoneal suppuration extending upward from the prostate, bladder, or lower ureter, and downward from the kidney or upper ureter. Right, Showing extension of retroperitoneal suppurative processes to the anterior surface of the abdominal wall. Note abscess in the perineum extending from the prostate gland.

needle will demonstrate the presence of pus and can be employed in case of doubt. The needle should be introduced at an angle in order to avoid an intraperitoneal puncture.

The best prophylactic measure to prevent this complication is the use of drains in genitourinary surgery, and in prostatectomy it is to be remembered that prolonged tension on the Pilcher bag will induce tissue ischemia which favors gangrenous infection of the prostatic loge. The author condemns the complete closure of kidney, ureteral, bladder, and prostatectomy wounds. The expectant treatment consists of the use of polyvalent serum, and the author reports that the use of the undenatured bacterial antigens of Professor A. P. Krueger of the University of California at Berkeley have been found most helpful especially in the more mild anaerobic infections. X-ray therapy is considered helpful but not to be relied upon entirely in the treatment of these infections. The surgical therapy should consist of wide and adequate incisions followed with lavage with some oxidizing agent such as Dakin's solution or hydrogen peroxide. When drainage is not adequate the patient is placed upon his abdomen on a Bradford frame. In particularly resistant cases the infected pockets should be injected with antigen by Besredka's method. ROBERT LICH, JR., M.D.

GASTROINTESTINAL TRACT

Maher, M. M., Zinninger, M. M., Schiff, L., and Shapiro, N.: Some Observations on Gastritis and Peptic Ulcer. *Am. J. M. Sc.*, 1943, 205: 328.

Gastritis is found very commonly in stomachs removed surgically for peptic ulcer and only slightly

less frequently in cases of duodenal ulcer. Superficial, hypertrophic, and atrophic gastritis are, in order, the types more commonly found.

The authors have studied the gastric changes in 40 patients with peptic ulcer, 28 of whom had gastroscopic examinations. The gastroscopic criteria of the various forms of gastritis used in this study were essentially those of Schindler.

Microscopically hypertrophic gastritis was diagnosed only in the presence of hyperplasia, and superficial gastritis was diagnosed when the inflammatory process involved only the upper portions of the mucosa. Atrophic gastritis of arbitrary Grades 1 to IV and characterized by a number of changes in the mucosa was found microscopically in 36 instances.

The gastritis found in patients with peptic ulcer was found to be very similar to that seen in patients with gastric cancer except for a higher incidence of hyperplasia in the ulcer group. This similarity suggests that the gastritis *per se* may not be a specific precursor of either gastric cancer or peptic ulcer.

There was a marked discrepancy between the gastroscopic and microscopic diagnoses. Microscopically atrophic gastritis was found in all of the 12 cases which were normal at gastroscopy and in 13 of the remaining 16. The necessity for further study of control groups of stomachs is stressed.

CONRAD L. PIRANI, M.D.

Sahler, O. D., and Hampton, A. O.: Bleeding Associated with Extramucosal Tumors of the Stomach. *Am. J. Roentg.*, 1943, 49: 442.

Extramucosal tumors of the stomach include a large variety of histopathologically different tumors. The roentgenological diagnosis of these extramucosal intramural tumors is dependent on the presence of a space-occupying, smooth or lobulated, partially pedunculated, usually sessile mass projecting into the lumen of the stomach from its wall. Viewed in profile, the tumor appears as extrinsic, but it is freely movable with the stomach. The tumor forms a definite abrupt angle with the uninvolved wall of the stomach. Although the angle may be acute if the tumor protrudes like a polyp, it is usually obtuse. Viewed *en face*, the barium shadow at the obtuse margin fades out gradually, and the tumor is not sharply defined. Ulceration, when present, is helpful in making the diagnosis; the ulcer is usually deep and smooth, the depth being as great as the width. There is no tendency toward spasm or incisura on the opposite wall of the stomach. The mucosal pattern of the stomach as a whole is normal, and the mucosa adjacent to the tumor is pliable. The mucosa over the tumor appears smooth and without its normal folds.

The differential diagnosis from cancer may be difficult, but is usually possible on the basis of the mucosal pattern. These tumors are usually sessile, as distinguished from polyps, which are usually pedunculated.

The gastroscopic findings in these cases are those of a tumor covered by smooth, rather atrophic mucosa, which may show ulceration in one or more areas. The ulceration is small in comparison with the total size of the tumor, and the mucosa overlying the tumor beyond the ulceration shows no evidence of infiltration.

The clinical findings in 24 intramural tumors of the stomach removed surgically at the Massachusetts General Hospital in a twenty-seven-year period are reviewed. It is concluded that bleeding is the most common, constant symptom in extramucosal tumors of the stomach. Two cases are reported.

HAROLD C. OCHSNER, M.D.

Boles, R. S.: The Prevention and Management of Ulcer. *J. Am. M. Ass.*, 1943, 121: 640.

From many quarters today come reports of the increasing incidence of peptic ulcer since the beginning of the war. This is true in both European countries and in America. Whether this is due to an actual increase in the number of cases or to better and increased numbers of x-ray examinations will be shown by critical analysis of the situation after the war is over. In many instances it has been obvious that ulcer symptoms appearing after admission to military service have resulted from activation of old ulcers because of the added strain and stress of army life.

Both in civilian and military populations, duodenal ulcer has shown an apparently greater increase than gastric ulcer, and chiefly in males. A number of factors having a common influence have been mentioned as predisposing causes of the increase of ulcer. Among these is the part played by anxiety, grief, and worry over loved ones, by disruption of the usual routine of life, irregularity and haste in eating, and by the increased incidence of both smoking and drinking. The marked increase in the smoking of cigarettes appears definitely connected with the increase of ulcers. It is generally recognized that nicotine primarily affects the autonomic nervous system, and all candidates for ulcer have a susceptible autonomic nervous system. Tobacco is admitted to affect the circulation, especially the vasomotor tone of the arteries, veins, and capillaries. Tobacco is also recognized as a cause of hyperacidity and in the fasting state produces a significant increase in both free and total acidity of the gastric juice as well as a considerable increase in the total volume in patients with duodenal ulcer. These facts justly place tobacco under suspicion as a factor in the cause and chronicity of ulcer.

The acid-corrosion theory of ulcer production is probably the oldest of all the theories. As a result of recent physiological investigations, the conclusion is reached that the corrosive action of the acid gastric juice and the proteolytic effect of pepsin are the major factors in the cause and persistence of ulcer. It would be without reason to deny that acid plays an important part, but that it plays the primary and major role is still open to question.

Today the surgical treatment of peptic ulcer has veered away from gastroenterostomy toward the

operation of subtotal gastrectomy. Wangensteen emphasizes that the most important criterion of an acceptable operation for duodenal ulcer is that it reduce gastric acidity effectually, and he believes that the three-quarter resection meets these demands. The only known manner in which acid secretion may be diminished effectually is by sacrificing a liberal portion of the gastric mucosa. Walters thinks that in gastric ulcers resection of one-half of the stomach is followed by excellent results, and recurrence has not taken place.

It is generally agreed that the uncomplicated ulcer is better treated by medical regime. Approximately only 20 per cent of all duodenal ulcers should call for surgical treatment. However, because of the hazard of gastric cancer, a much larger number of gastric ulcers demand surgical intervention. The x-rays cannot be relied upon to determine whether or not an ulcer of the stomach is malignant.

The generally accepted indications for surgery are perforation, recurrent hemorrhages, obstruction not quickly relieved, suspicion of malignancy in gastric ulceration, and the intractable type of ulcer that fails to respond to medical treatment and diet.

Since the general practitioner frequently has the deciding voice concerning operation, he should inform himself of the "trends of good surgical experience" and of the prospects of a cure for his patient. He should know that a "cure" is based in large measure on the temperament and co-operation of the patient as well as on the judgment and ability of the surgeon. Both physician and surgeon should make a more serious effort to prevent complications.

While at the present time there would seem to be no satisfactory alternative to radical surgery, in complicated cases let it be done with the definite understanding that elimination of acidity is not the last word although it is an important word in the treatment of peptic ulcer. JOHN W. NUZUM, M.D.

Usher, F. C., and Dixon, C. F.: Lymphosarcoma of the Intestines. *Gastroenterology*, 1943, 1: 160.

The records of 50 patients who had lymphosarcoma of the small and large intestines and who were seen at the Mayo Clinic have been studied. The tumors were divided into two histological groups: (1) reticulum-cell sarcoma, and (2) maligant lymphocytoma (small round-cell sarcoma). Twenty-five of the tumors were classed in the first group, and 25 were classed in the latter group.

Lymphosarcoma was found to occur more often in the small than in the large intestine, with the exception of the cecum, at which site 36 per cent of the tumors occurred. Thirty-eight per cent were found in the jejunum and ileum, 20 per cent in the rectum, and only 6 per cent (3 tumors) in the colon.

In the cases reviewed the tumors occurred at all ages, but most often in the sixth decade (11) and the fifth decade (9). The average age of the patients who had lymphosarcoma of the jejunum, ileum, and cecum was forty years. The average age of the patients who had rectal lymphosarcoma was fifty-six years. Males showed a greater predisposition to the disease than females, the ratio being approximately 2 to 1.

Certain symptoms are fairly characteristic. Colicky pain is rather common with loss of weight, secondary anemia, and a palpable abdominal tumor. Melena is uncommon.

The roentgenological diagnosis is easily made when lymphosarcoma of the cecum is present, but is difficult and is rarely made successfully when lymphosarcoma of the small intestine is present. Biopsy of specimens taken from the rectum is an important and certain method for the diagnosis of lymphosarcoma in that region.

The average duration of symptoms was a year. The lesions of lymphosarcoma of the rectum apparently are slower in growing; several patients were seen who had symptoms of four years' duration.

Surgical operation was performed in 44 of the 50 cases, with a mortality rate of 27.3 per cent (12 deaths). Most of these operative deaths were caused by peritonitis and resulted from operations on patients who had perforated lesions and on patients whose disease was in an advanced stage, with adhesions, so that the tumor might have been torn accidentally during removal. Too few patients were treated by surgical operation alone, or by irradiation alone, to permit comparison of the efficacy of the two methods, since most of the patients treated surgically also received postoperative irradiation.

Lymphosarcoma of the cecum is associated with the best prognosis, the average period of survival of patients being eight years, as compared to two years for those who had lymphosarcoma of the rectum, and nine months for those who had lymphosarcoma of the small intestine.

Metastasis was found to be present in 68 per cent of cases, in the mesenteric lymph nodes. The liver was seldom involved, a fact which would suggest that metastasis via the blood stream is infrequent.

Recurrence was more frequent in lymphosarcoma of the small bowel; less common in lymphosarcoma of the cecum. All but 2 of the 19 patients who had lymphosarcoma of the small bowel died of recurrence within a year. Of the 18 who had lymphosarcoma of the cecum, 11 remained free of recurrence for five years or more after surgical operation and postoperative irradiation.

Of the 3 patients who had lymphosarcoma of the colon, 1 survived and had no sign of recurrence after seven years.

All patients who had lymphosarcoma of the rectum, (except those encountered too recently to permit the authors to evaluate the results of treatment), died of recurrence within four years.

Hinton, J. W.: The Intractable Duodenal Ulcer. *Ann. Surg.*, 1943, 117: 498.

During the past decade, even surgeons have admitted that medical management is the treatment of choice for duodenal ulcer, and that surgical intervention should be confined to the intractable cases.

The author questions the usual indications for surgical intervention, namely, obstruction, massive hemorrhage, a perforating ulcer, and the fact that the patient refuses to co-operate under medical management. Based upon his fifteen years' experience in stomach clinics he finds that the only true indication of intractability in the case of a duodenal ulcer has been constant pain, unrelieved under any form of medical management.

Pyloric obstruction without pain is due to edema and pylorospasm and not to scar tissue around the pylorus. Since 1932 no patient with pyloric obstruction unaccompanied by severe pain has been referred for surgical intervention, either in private consultation or in the clinics, exceptions being 2 patients who developed true organic obstruction without pain, following a simple closure of perforated duodenal ulcer, which necessitated a short-circuiting operation.

Massive hemorrhage, when there is a red-cell count of 2,000,000 or less, a hemoglobin of 40 per cent or less, and lowered blood pressure with moderate shock, occasionally calls for surgical intervention in the desperate cases which do not respond to continuous transfusions. The mortality under medical management from 1928 to 1937 on the Fourth Surgical Division of Bellevue Hospital was 10 per cent, while from 1937 to 1942, inclusive, the mortality under medical management was nil, while with surgical intervention in the desperate cases, 1 case was lost.

The penetrating or perforating duodenal ulcer, as diagnosed roentgenologically, does not necessarily constitute a true indication for surgical intervention. Here, one must rely on the clinical evaluation of the symptomatology. If the patient has had an ulcer for years with intractable pain, then the indications are obvious, but if he has had this type of ulcer for only a short period of time, medical management very frequently will relieve the symptoms and the niche will disappear.

The patients who will not co-operate under medical management should not be operated upon. If one accepts this type of case as an indication for operation, the results from any type of surgical precedure, whether it be a gastroenterostomy or a subtotal resection, will be most unsatisfactory.

Subtotal resection is now accepted as the operative procedure for intractable duodenal ulcer. If one accepts the teaching that achlorhydria is the goal to reach in subtotal resection, then there is a definite reason, in all instances, for removing the pylorus and adherent ulcer. There is little doubt that in those cases in which a subtotal resection of 50 to 75 per cent of the stomach is done and the duodenal ulcer and pyloric end of the stomach is left *in situ*, the follow-up results are far from satisfactory. This may be due to a hormone secreted by the pyloric end of the stomach which continues to promote hyperacidity.

In every operation for duodenal ulcer performed during the past ten years, the author removed from 65 to 70 per cent of the stomach, and the pylorus and duodenal lesion *in toto*. Among 150 cases there were none which, because of technical difficulties, could not be treated in this manner.

The technique followed was to divide the gastrocolic omentum just proximal to the adherent mass and carry the incision proximally along the greater curvature to a point well above the re-entrant angle of the stomach, after which the vessels in the gastrohepatic omentum were divided down to the mass. The stomach was then transected from right to left above the re-entrant angle. This exposed the adherent mass in the pancreas and duodenohepatic ligament so that it may be freed under better visualization. The duodenal stump was carefully closed with four layers of sutures to invert the stump completely. The continuity of the jejunum and stomach was re-established by an antecolic, short-loop, side-to-end anastomosis. The abdominal wall was always closed without drains. The suture material used throughout was cotton.

Preoperatively the patients received treatment to restore fluid balance and Vitamin B and C deficiencies. Saline solution was preferred to glucose for hydration. The anesthetic was given by the endotracheal method. Postoperatively, morphine was given sparingly so as not to interfere with the cough reflex. The Levine tube was passed one hour before operation; it was irrigated every hour postoperatively for forty-eight hours and left open for gravity drainage. Fluid was given by mouth as soon as the patient was awake, as it served as a cleansing agent for gastric mucin.

These patients averaged seventeen days in the hospital preoperatively and nineteen days postoperatively.

In conclusion, the author believes that the only indication for operation on chronic duodenal ulcers is uncontrollable pain which does not respond to any form of medical treatment. If the indications given have been observed, gastrojejunal ulcer is a most uncommon occurrence following subtotal resection, but it will commonly follow subtotal resection unless the patient is given every chance under conservative management.

The article contains excellent illustrations of the technical procedure. JOHN E. KIRKPATRICK, M.D.

Duff, G. L., Foster, H. L., and Bryan, W. W.: Primary Carcinoma of the Infra-Ampullary Portion of the Duodenum, with an Example of Probable Origin from Aberrant Pancreatic Tissue. *Arch. Surg.*, 1943, 46: 494.

Primary carcinoma of the duodenum is usually classified according to its relation to the ampulla of Vater as supra-ampullary, periampullary, and infra-ampullary. In any of these situations, carcinoma of the duodenum is rare. The following case of primary carcinoma of the infra-ampullary portion of the duodenum is reported because of the rarity of the condition, because it demonstrates the possibility of reaching a correct clinical diagnosis by means of careful x-ray examination, and because it illustrates

the possible origin of the carcinoma from aberrant pancreatic tissue.

A Pole of thirty-five years was admitted to the Royal Victoria Hospital with the following history: A heavy smoker and drinker, he was in good health until six months prior to admission. He noted attacks of epigastric pain late after meals and relieved by food. The symptoms progressed and he began to lose appetite, weight, and strength. Vomiting occurred with increasing frequency. Physical examination revealed a thin male with diffuse tenderness throughout the abdomen but no palpable mass. There was a firm nodular mass palpable in the anterior wall of the rectum with many small subcutaneous nodules scattered over the entire body. The stomach showed no free hydrochloric acid and the total acidity was between 20 and 40. The blood count was normal.

Roentgenological examination showed just distal to the junction of the second and third portions of the duodenal loop a definite narrowing with irregularity of the lumen of the duodenum. Only a small channel permitted barium to pass through to the jejunum. The opinion of the roentgenologist was that the zone of deformity and irregularity and narrowing involving the distal portion of the duodenal loop was due to an intrinsic lesion of the duodenum, probably a neoplasm, with an ulcerated area in this zone. An exploratory laparotomy revealed a large tumor mass involving the duodenum at the duodenojejunal junction. There were numerous metastases to the parietal peritoneum and in the mesentery of the small intestine. A biopsy revealed adenocarcinoma. The patient's vomiting continued and his condition became progressively worse. He died four weeks after operation and about seven and one-half months after the first onset of symptoms.

Autopsy revealed a firm nodular mass 6 by 4 cm. in the region of the duodenum almost completely encircling the infra-ampullary portion and displacing the pancreas superiorly. In the superior aspect of the duodenum there was a deep ulcerated area with a soft necrotic base and overhanging edges about 1.5 cm. distal to the ampulla of Vater. Distal to this, the tumor mass bulged into the lumen and this mass produced almost complete duodenal obstruction. The duodenal wall was thickened by tumor tissue spreading beneath the mucosa. The stomach and duodenum were markedly distended. The microscopic appearance of the tumor tissue suggested an origin from pancreatic tissue.

JOHN W. NUZUM, M.D.

Atkinson, A. J., Adler, H. F., and Ivy, A. C.: Motility of the Human Colon. The Normal Pattern, Dyskinesia, and the Effect of Drugs. *J. Am. M. Ass.*, 1943, 121: 646.

There appears to be a paucity of knowledge regarding the motor activity of the human colon and much divergence of opinion regarding its response to stimulating and "antispasmodic" drugs. Alvarez states that the colon is a sluggish organ with few and slow movements. The movements of the haustra are very slow. A few times each day there are mass movements which carry material from the transverse colon over into the sigmoid region. Much of the progress of material seems to be due to the pressure exerted by new material coming down from above. This concept of the plunger effect acting on the bowel content in the lower segment of the large bowel is due primarily to the inadequacy of the x-ray method for studying colonic motility.

Four human subjects with colostomies were studied mornings and afternoons for eight months. The rectum and lower sigmoid of each had been previously removed and the subjects were in excellent general condition. Patients were studied one hour after breakfast when the colon and sigmoid were empty and again after a standard luncheon. The results on human beings pertain only to the descending colon, from the splenic flexure downward to the colostomy. The normal pattern of the motility of the human colon was carefully studied in a series of 4 men. These patients had a colostomy and by repeated experiments over a relatively long period of time, the authors have attempted to explain how an alteration of the normal pattern, by influences which affect the co-ordination between segments, may produce constipation and symptoms of tension and colic. The effects of various drugs were studied. The simultaneous injection of a solution of the posterior pituitary lobe hormone (1.25 units), prostigmine methylsulfate (0.25 mgm.) and ergotamine tartrate (0.25 mgm.) was found to cause a prompt and prolonged increase in the propulsive motility of the human colon without side reactions. Morphine sulfate (8 to 16 mgm.) is not an antispasmodic in the sense that all motility is inhibited. It increases the tone and nonpropulsive motility and definitely decreases or abolishes the propulsive motility.

Of the various antispasmodic drugs studied, atropine sulfate and trasentin proved to be the most potent depressants. The ideal spasmolytic drug for the colon has yet to be discovered.

JOHN W. NUZUM, M.D.

Jackman, R. J., and Buie, L. A.: Diverticula of the Colon. Proctoscopy as an Aid in the Diagnosis and Differential Diagnosis. *J. Am. M. Ass.*, 1943, 121: 1144.

A study of 400 cases of diverticula of the colon has been made. The diagnosis was made clinically and by roentgenological examinations in 150 of the cases, and clinically and by proctoscopic examination in 8. In the remaining 242 cases both roentgenological studies of the colon and sigmoidoscopic examinations were performed. In 160 of these 242 cases sigmoidoscopic examination revealed or gave some evidence of the presence of diverticula. In 35 of these 160 cases the proctoscopist saw diverticula (sacculations also in 18 of the 35); in 72 he found sacculations, and in 53 he found one or more of the following: immobility, sharp angulation, narrowing of

the lumen, mucosal edema, an extrarectal mass, or inability to pass the proctoscope the average distance.

In another group of 50 cases, in which colostomy had been performed as an emergency measure because of an obstructing lesion in the lower part of the bowel and in which the preoperative diagnosis was indeterminate, a study was made in order to learn the value of sigmoidoscopic examination performed by way of the anus or the colonic stoma. Sigmoidoscopic examination was responsible for the diagnosis in 37 of the 50 cases.

The following conclusions are drawn:

1. Roentgenology provides the most valuable single aid in establishing the diagnosis of diverticula of the colon.

2. The most valuable single proctoscopic finding, aside from actual sight of the diverticula, is the presence of sacculations.

3. The proctoscopic findings of immobility of the bowel, angulation, mucosal edema, narrowed lumen, and extrarectal mass are of value, but it should be remembered that some of these signs are observed in other diseases of the pelvic organs.

4. Our study would indicate that proctoscopy is a valuable adjunct to clinical and roentgenological study to determine the nature of obstructive lesions in the lower part of the bowel.

Wigby, P. E.: Postirradiation Stricture of the Rectum and Sigmoid Following Treatment for Cervical Cancer. *Am. J. Roentg.*, 1943, 49: 307.

The author reviews a series of 100 cases of cervical cancer in which the dosage was maximum and a relatively high percentage of bowel reactions, chiefly within the sigmoid and rectum, occurred. In 23 cases death resulted less than six months following completion of treatment, or only a small amount of palliative radiation was given, and, therefore, these cases are not included in the tabulation. The data obtained in the remaining 77 cases are shown in Table I.

TABLE I.—SUMMARY OF 77 CASES

	Reactions				Previous Laparotomy	Syphilis	Clinical Group			
	None	1st degree	2nd degree	3rd degree			I	I	III	IV
White	9	11	12	3	13	5	4	13	9	9
Colored	24	9	6	3	7	14	3	7	10	22
Totals	33	20	18	6	20	19	7	20	19	31

As is noted "no reaction" was observed in 33 cases. In 20 cases there was a first-degree reaction, characterized by hyperemia and bullous edema of the bowel which as a rule started during the third week of roentgen treatment and cleared up spontaneously or as a result of the administration of paregoric. In 18 cases there was a second-degree reaction, consisting of ulceration with many bleeding points, plus hyperemia and bullous edema. The ulceration occurred either in the form of a fairly typical punched-out single round ulcer or in the form of irregular single or multiple ulcers of "beefy" red appearance, occasionally leading to temporary stricture of short duration. Clinically, there was diarrhea, bearing-down rectal pains and bleeding in small or large old clots or with fresh gross hemorrhage. The treatment consisted of starch and warm saline enemas after bowel movement, followed by the instillation of from 4 to 6 oz. of warm olive oil to be retained as long as possible. This reaction lasted for six months or longer after irradiation was completed. In 6 cases, there was a third-degree reaction, which, in fact, represented progress of former changes to fibrosis of one or more of the intestinal coats with or without extrinsic fibrosis. Whatever degree of stricture resulted, it was permanent, necessitating resection or colostomy. Small-bowel obstruction was not encountered in any of the cases.

The author describes in detail the technique of the irradiation which was used in the entire series. The general plan included external roentgen therapy to the pelvis followed immediately by intracavitary radium. The roentgen therapy was carried out with 200 kv. const., 0.75 mm. of copper or medium Thoraeus filters, HVL. 1.18 mm. to 2.12 mm. of copper, 18 ma., and 52 cm. focal skin distance. The pelvis was cross-fired through 4 or 6 portals of 15 by 15 cm. for the first 62 cases and of 10 by 15 cm. for the remainder. The daily dose (except Sunday) varied from 200 roentgen to one portal to 250 roentgen to each of two portals, alternate portals being treated on successive days. The protraction extended from twenty-five to thirty days, the largest total dose on an external portal amounting to 3,000 roentgens when 4 portals and 2,000 roentgens when 6 portals were used. Since January, 1940, intravaginal roentgen irradiation through an Odmann cone of 3 or 4 cm. in diameter was added in certain instances with daily doses of 450 roentgens given concurrently with the external series until a total of 5,000 roentgens was reached. The radium was applied in two stages. First, a four-chambered tandem silver capsule was placed into the uterine cavity and cervical canal with a suitable filter for a total of 3,000 mgm.-hrs., then a few days later a London or Kaplan colpostat or single rubber cylinder, containing 2 or 3 capsules, was introduced into the vaginal fornices for another 2,000 or 3,000 mgm.-hrs. In 13 cases the roentgen series was repeated with the same technique, but with only 1,000 to 1,200 roentgens per portal.

Four illustrative cases are reported in brief résumés. In one of these cases, autopsy findings are included.

The following conclusions are drawn:

There is an individual susceptibility to radiation therapy. Some of the "no reaction" cases received more treatment than certain of those suffering third-degree reactions. On the other hand, reactions oc-

curred several months or years after treatment, in those cases in which there were no immediate reactions. The symptoms of these late reactions may be mistaken for hopeless recurrence. In 57 per cent of the cases some sort of bowel reaction was observed, varying from slight diarrhea to stricture formation. In 7.9 per cent colostomy was necessary. No fatal hemorrhage occurred in the series. The late reactions of the rectum and sigmoid were either extrinsic or intrinsic, or a combination of both. In patients suffering second- and third-degree reactions, occasional rectal bleeding may never entirely disappear.

T. Leucutia, M.D

Lamson, O. F.: An Appliance for Colostomy Control. *West. J. Surg.*, 1943, 51: 127.

Leakage from colostomies and ileostomies can be controlled by an appliance which is simple in construction, painless, easy to adjust, and not irritating to the bowel. This device is composed of a rubber balloon which can be inflated to obstruct the bowel lumen and is attached to a disc which fits over the external opening of the ostomy (Fig. 1). Removal of the appliance permits evacuation of the bowel, after which it can be replaced in position easily.

Edward W. Gibbs, M.D.

Fig. 1. A, Drawing of external disc; B, dotted line shows balloon inflated. Balloon is attached to the disc by rubber tube through which it is inflated. A valve located in the central portion of disc controls the inflation and deflation of the balloon.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Ulin, A. W.: Therapeutic Trends and Operative Mortality in Cases of Obstructive Jaundice. *Ann. Surg.*, 1943, 46: 504.

After synthetic Vitamin K and various related substances had been used parenterally for over one year, and excellent results had been obtained in the control of postoperative bleeding, the impression was gained that at last the problem of the jaundiced patient undergoing surgical treatment was under control. This impression is not entirely correct. It appears now that although Vitamin K has reduced postoperative bleeding, it is unreasonable to rely entirely on Vitamin K in preparing jaundiced patients for operation, but rather this substance should be regarded as an adjunct in treatment, along with diet, blood transfusions, plasma, and other measures. Vitamin K itself has not appeared to solve the problem of operative mortality in cases of obstructive jaundice. The reasons for failure are enumerated.

Ravdin and his coworkers have advocated a high protein and high carbohydrate diet to afford the best degree of protection to the liver. Doubt is cast on the intravenous use of dextrose as the sole preoperative measure, while other workers have stressed the value of the intravenous administration of dextrose in providing a strong immediate stimulus for glycogenesis.

The results of 42 operations performed in the last three years with an operative mortality of 29 per cent are presented and analyzed. By the proper use of Vitamin K, the problem of postoperative hemorrhage was solved. It was only after the application of a complete therapeutic regimen that the operative mortality was significantly reduced. Response to Vitamin K as an index of hepatic function is discussed. Some pathological changes both in the liver and pancreas were studied and discussed.

John W. Nuzum, M.D.

Golob, M.: Diverticulum of the Gall Bladder. A Review of the Literature and Report of a Case. *Am. J. Digest. Dis.*, 1943, 10: 148.

Preoperative diagnosis of diverticulum of the gall bladder can be made only by cholecystography. Twenty articles have been written on the subject since 1923, some under the term of pseudodiverticulosis. Six cases were detected roentgenologically, but not all were confirmed by operation. Some were diagnosed operatively and others at autopsy. That Rukstinat's 3 cases, reported in 1936, constitute about 15 per cent of all cases recorded in the literature attests to the rarity of the anomaly. It is not an uncommon finding at operation or autopsy, but in spite of its relative frequency of occurrence, preoperative diagnosis is rarely made. Barsony in 1927, and Barsony and von Friedrich in 1928, reporting a case of diverticulum of the gall bladder which was cholecystographically detected and surgically confirmed, claimed that as far as they knew there were

no previous reports of roentgenological diagnosis and operative confirmation.

In the author's case a diverticulum was diagnosed in an otherwise normal gall bladder.

J. M. MORA, M.D.

Christopher, F., Benjamin, E. L., and Gowdy, F. K.: Infarction of the Gall Bladder. *Surgery*, 1943, 13: 444.

Gangrene of the gall bladder without infection and due to infarction is uncommon. The following possible causes of gangrene of the gall bladder are listed: (1) infection; (2) edema of the structures adjacent to the cystic vessels; (3) stones plus infection and pressure; (4) mechanical factors, including (a) torsion, (b) angulation of the cystic duct by distention, (c) glands or tumors, (d) embolism or thrombosis of the cystic ducts (no proved case), and (e) distention spasm. Four cases of gall-bladder infarction are reported. In 2 of these, there was arterial change, and in 2 there was venous thrombosis.

Apparently there is no accurate guide to the diagnosis of gangrene of the gall bladder. There may be marked tenderness and rigidity in the right upper quadrant, but the symptoms may be mild.

The authors give a case report of a patient presenting a mass in the upper right quadrant which on operation proved to be a badly distended gangrenous gall bladder. The organ was removed and the patient recovered completely. Pathological examination of the specimen revealed absence of all normal-appearing possibly viable tissue.

STEPHEN A. ZIEMAN, M.D.

Bagnati, E. P.: Massive Gangrene of the Gall Bladder (Gangrena masiva de la vesicula biliar). *Rev. med. quir. pat. fem.*, B. Air., 1943, 10: 29.

Gangrene of the gall bladder is a very unusual condition, especially a total gangrene such as the one described in the author's case. The patient in this case was a woman of forty-two who had a history of attacks of intense pain in the right hypochondrium with irradiation to the shoulder, accompanied by nausea, vomiting, and severe headache. The symptoms suggested acute appendicitis as they frequently do in this condition. Operation showed diffuse infarction of the wall of the gall bladder, evidently caused by a stone that has obstructed the mouth of the cystic duct. There was torsion of the gall bladder. The pathological lesions were much more severe than the symptoms suggested and, in fact, the symptoms had improved greatly after the patient's admission to the hospital. Operation with removal of the whole gall bladder was followed by uneventful recovery. The removal of the gall bladder was easy as the gangrene had produced a sort of natural line of cleavage.

These cases generally occur in old people, most frequently over sixty years of age. Obstruction of the cystic duct or of the blood vessels seems to be the chief factor in their causation, rather than infection. The cystic vein and lymphatics are frequently compressed. Another mechanism of production is embolism of the cystic artery which cuts off the blood supply to the gall bladder. Two such cases have been reported in Argentina.

Early diagnosis is important as the necrotic gall bladder may perforate and cause acute peritonitis, the symptoms of which mask those of the primary disease. The disease progresses rapidly and in the beginning may be confused with a simple hepatic colic, which makes it all the more dangerous. The polymorphonuclear cells are generally increased but this is not always true. Diagnosis is generally difficult, but the presence of the picture of severe cholecystitis with intense pain in the right iliac fossa justifies the diagnosis of gangrene or perforation of the gall bladder.

AUDREY G. MORGAN, M.D.

Hooker, D. H.: Exploration of the Common Bile Duct; Review of 165 Cases. *Am. J. Surg.*, 1943, 60: 88.

At the Henry Ford Hospital, Detroit, Michigan, cholecystectomy was performed on 2,117 patients in the past twenty years. Choledochotomy and exploration of the common bile duct was done in 165 of these patients, approximately 1 in every 13. The indications for common-duct exploration are not given.

The majority of the patients presented a syndrome of epigastric pain, usually on the right side, accompanied by nausea, vomiting, or eructation. Chills and fever were noted in 64 of the 165 cases. More than half of the patients were in the fifth and sixth decades of life and 69 per cent were females.

Analysis of the laboratory findings revealed an elevated icteric index, usually below 50, and bile in the urine in more than half of the cases. Clinical jaundice was observed in 122 patients. No bile was found in the stool in one-fifth of the cases. In 88 cases the blood leucocyte count was less than 10,000. Duodenal biliary drainage was found to be a valuable diagnostic aid when a positive report was obtained. X-ray diagnosis of biliary-tract pathology was found to be correct at the time of operation in 89 of 91 cases.

T-tube drainage of the duct was used in 138 patients, plain rubber catheter drainage in 17, and no drainage in 6. The wound was not completely healed until forty days after operation in half of the cases. Bile ceased to flow from the wound in the majority of cases after the first month, but occasionally drainage persisted for longer than two months.

The operative mortality was 9 per cent. Calculation of the mortality rate by five-year periods disclosed a steady reduction from 20.0 per cent in the period from 1921 to 1925 to 6.8 per cent in the period from 1936 to 1940.

Cardiac failure or wound hemorrhage were the most frequent causes of death and accounted for 9 of the 15 mortalities. No deaths have been attributed to wound hemorrhage since Vitamin K therapy was instituted.

EDWARD W. GIBBS, M.D.

Gray, H. K., and Sharpe, W. S.: Biliary Dyskinesia. The Role Played by a Remnant of the Cystic Duct. *Arch. Surg.*, 1943, 46: 564.

Biliary dyskinesia, regardless of its cause, is a distressing problem. The two most probable causes of its occurrence are (1) the erroneous diagnosis of cholecystitis and ill advised removal of the gall bladder with the persistence of some functional disorder of the choledochus sphincter, and (2) residual inflammatory disease of the liver, pancreas, or ductile system. The possibility that some inflammatory or mechanical lesion of the cystic duct may cause typical symptoms of cholecystic disease suggests that a similar lesion in a remnant of cystic duct may be the obscure cause of persistent postcholecystectomy pain. In many cases the removal of this remnant of cystic duct has been coincident with choledochostomy and choledocholithotomy. If the original operation was performed on the basis of adequate historical or roentgenographic indications, or both, about 70 per cent of such patients have been found to obtain relief of persistent symptoms by the second operation in which the cystic duct, with or without stones, is removed.

In this series of 44 cases, all specimens of cystic duct removed showed evidence of disease; in 35 cases (79 per cent) there was marked evidence of recent inflammation.

In a series of 26 cases of biliary dyskinesia in which at the second operation only an enlarged inflamed remnant of cystic duct was incriminated and removed, approximately 65 per cent of the patients were relieved of their symptoms, provided that the first operation was well advised and necessary. If the first operation was performed on the basis of inadequate indications, 100 per cent failure resulted from the secondary operations in which only drainage of the common bile duct or removal of a remnant of cystic duct could be accomplished.

Too great stress cannot be placed on the importance of operating only in those cases in which there is definite and conclusive clinical or roentgenographic evidence of disease of the biliary tract. At the time of operation, meticulous care must be exercised in order to avoid damage to the common bile duct, but at the same time all but a very small remnant of the cystic duct should be resected. In those cases in which the patients unfortunately experience persistence or recurrence of pain after cholecystectomy, and in which reoperation is deemed necessary, diligent search should be made for a remnant of the cystic duct whether or not calculi are suspected in the common bile duct.

MISCELLANEOUS

Howard, J. T.: Gastroscopy and the Use of the Gastroscope in the Military Services. *War Med.*, Chic., 1943, 3: 274.

Schindler's article, "On the Importance of the Gastroscope in the Diagnosis of the Gastric Diseases in the Army," which appeared in the British Medical Journal, stimulated Howard to make further investigations in this field. Of the many soldiers Schindler examined gastroscopically in 1921 and 1922 at the request of physicians of a military pension hospital, 13 presented special case histories. Chronic gastritis was the cause of symptoms in only 7 of the German veterans of World War I so examined. In 4 of these 7 soldiers ulcerations or erosions of the mucosa were noted. One patient without gastritis presented a benign tumor. Two of the 13 veterans had gastric ulcer, but in 1 of them the ulcer was not visualized by the roentgen methods then in use. The remaining 3 had normal gastric mucosa.

Schindler maintained that in all fairness to dyspeptic men in the services, physicians trained in gastroscopy should be available in order to separate veterans with organic diseases of the stomach from those with functional disturbances and from malingerers. Schindler stressed 1 soldier's case of gastric lesion that was demonstrable only with the gastroscope; this patient would otherwise have been labeled as neurotic or malingering.

Howard, a member of the medical advisory board at an American induction station, attempts to answer the question, "How greatly will the gastroscope help in the recognition of peptic ulcers in the American forces?"

The care with which selectees are studied before they are put into military service greatly limits the number of peptic ulcer cases occurring in the American services. Objective evidence of present or old gastric or duodenal ulcerations excuses men from military duty. In the British Army men who have had peptic ulcerations in civil life are not excluded; hence, the incidence of symptom-producing gastric and duodenal ulcers there has been surprisingly high. Since the American Army has been freed of its personnel with old ulcers by rather thorough filtration it seems likely that relatively few new gastric ulcers will develop in its soldiers. In the diagnosis and treatment of gastric ulcers the gastroscope will, of course, be helpful.

Beaumont was the first to record mucosal changes which he had visualized in the human stomach. Possibly it will be the fortune of other soldiers to reach conclusions about the interpretation of mucosal changes which are now seen gastroscopically and which are called manifestations of gastritis.

The gastroscope permits envisioning almost all of the interior of a patient's stomach; and recent improvements in the instrument are increasing the optical range. Tumors and ulcerations, some of which escape detection by roentgen rays, are visualized with the gastroscope. On the other hand, roentgenography may reveal lesions not detected by gastroscopic examinations. The easy detection of the grosser gastric lesions will establish the gastroscope in its merited place in military services and do much to promote its use in civil work. Howard considers the use of the gastroscope with reference to (1) gastritis, (2) gastritis and peptic ulcer, and (3) gastritis and carcinoma.

By gastritis is meant inflammatory changes in the gastric mucous membrane. There seem to be two etiological factors in the production of atrophy of the gastric mucosa. One is inflammation, the other is probably degeneration from a deficiency of some maintaining substance. The gastroscopic appearance, at least, can be restored to normal in some cases of mucosal atrophy by liver therapy.

American physicians agree that gastritis is best diagnosed by inspection of the mucosa through the gastroscope.

Gastritis may be a manifestation of disease elsewhere; it may be an incidental finding of no true significance, or it may be a cause of symptoms. Discrepancies between signs and symptoms sometimes occur. At times symptom-free periods present exactly the same picture of gastritis with redness, edema, and erosions. Yet in patients with gastric ulcerations, asymptomatic ulcers are relatively rare and the healing of symptom-producing ulcers is usually accompanied by remission of the symptoms. In gastric ulcers symptoms are usually associated with the sore, and their remission is associated with the healing of the crater. Frequently gastritis is an incidental finding, therefore one must not allow the finding of gastritis to terminate a search for other pathological conditions in the abdomen. There seem to be no syndromes which make the diagnosis of gastritis likely. Gastritis may be a possible diagnosis, but one should not blame a red stomach for all symptoms which cannot be explained on any other organic basis. Sometimes persons with a red stomach may show a positive story of neurosis. Such a nervous state is more likely to cause gastric symptoms than a gastritis of moderate degree. The diagnosis of gastric neurosis or of psychoneurosis is not always a negative one.

The question arises whether chronic gastritis predisposes to more serious conditions of the stomach, such as chronic peptic ulcer or cancer. As a rule, a gastric ulcer is not particularly likely to develop in a patient with gastritis. The statement that gastritis leads to peptic ulcer is not proved at this time. Whether carcinoma arises more frequently from a bed of gastritis than from a normal mucosa, no one knows. Many physicians believe that an atrophic mucosa is a forerunner of a malignant growth in the stomach. As a matter of fact most cancers of the stomach arise in persons who have had no previous digestive trouble. The author recommends gastroscopic examination of patients with atrophic mucosa. Since the procedure is simple it can be repeated frequently and thereby an early cancer may be recognized.

With reference to military service it is safe to say that the number of cancers arising will be minimal. A certain number of gastric ulcers will develop, and the gastroscope will be useful in studying them. The cases of gastritis occurring in the services will be more numerous, and these cases will make available for observation a large number of "red stomachs." The data collected will determine, or help to determine, the clinical status of gastritis, concerning which there is at present no agreement.

MATHIAS J. SEIFERT, M.D.

Berger, W. V., and Oppenheim, E.: The Drainage Output of the Human Duodenum. Extrinsic Factors Influencing Drainage; Physiological Factors Influencing Drainage, Including a Method for Quantitative Duodenal Drainage. *Gastroenterology*, 1943, 1: 285, 292.

A review of the physiology of the secretory and motor functions of the human duodenum presents several unsettled problems which are important from both the theoretical and practical standpoint.

Since in physiological studies in man duodenal drainage plays an important role, a perfect understanding of the factors influencing the duodenal output is a necessary prerequisite for an advanced insight into the physiology of the duodenum. A dominant question is whether these factors permit the quantitative removal of the secretions entering the duodenum by duodenal drainage, or if part of them escape down into the jejunum.

The factors to be considered are the extrinsic, and the intrinsic or physiological factors. The extrinsic factors include the properties of the duodenal tube and the amount of suction. The influence of these factors was studied by draining fluid from a large basin by syphonage. The volume of fluid obtained in a given unit of time is the resultant of the extrinsic factors. This is termed the "drainage efficiency" of the tube at a given suction.

The physical properties of the tube were studied with consideration of the influence of the size of the lumen with suctions of from 90 cm. of water to 15 cm. of water. The caliber of the tube does not necessarily reflect the size of the lumen. The length of the tube produced a drainage efficiency that varied inversely with its length. The drainage surface, including open tubes and closed-end tubes with lateral openings, produced diminution of drainage as the openings narrowed in relation to the cross section of the tube. The greatest drainage efficiency was achieved when the total surface of the drainage openings exceeded the cross section of the tube. The attachment of buckets decreased drainage only at the high suction of 90 cm. of water.

Suction experiments showed a parallel decrease of drainage efficiency with decreasing suction, although it was still considerable at suctions of 10 and 5 cm. of water. Connections for tubing somewhat inhibit drainage if their bore is narrower than the tubing. The Moses Einhorn double tube had practically the same efficiency with and without attachments. In duodenal drainage there was no difference in the outflow between the sitting and lying positions. The viscosity of duodenal fluid did not influence drainage efficiency.

For application to clinical duodenal drainage this efficiency has to be compared with the rate of flow of the natural secretions into the duodenum. The maximal natural flow passing through the papilla of

Vater under conditions of duodenal drainage was estimated. It was found to be not greater than 5 cc. in thirty seconds. If the gastric secretion is not eliminated or reduced by simultaneous gastric drainage, incidental gushes of 15 cc. in five seconds may occur, but in any event the total secretion into the duodenum is no more than 40 cc. in five minutes. This is the maximum rate of flow which the tube has to accommodate during duodenal drainage.

It is proposed to classify duodenal tubes in two ways: (1) by their measurements, such as size of lumen, length, and total size of drainage openings (total drainage surface), and (2) by their drainage efficiency as measured by millimeters of flow per thirty seconds at one or various degrees of suction.

The drainage efficiency of all the tubes examined exceeded at a suction of 60 cm. the maximal natural inflow into the duodenum. At a suction of 15 cm. the efficiency of most of the tubes exceeds the maximal natural inflow.

The extrinsic factors of duodenal drainage provide the possibility for quantitative removal of the natural secretory inflow into the duodenum.

The intrinsic or physiological factors influencing the quantitative drainage efficiency are: (1) intermittent inflow of small amounts of fluid into a collapsible elastic gut, (2) intraduodenal pressure, and (3) duodenal motility.

The purpose of the experiments was to ascertain whether these factors reduce the efficiency of the drainage below the level of the natural secretory inflow into the duodenum. The maximal secretory inflow per thirty seconds is approximately as follows: biliary pancreatic secretion, 5 cc.; gastric secretion, 18 cc.; total, 23 cc.

This maximal inflow, however, was observed rarely and only for short periods of time. The entire output for five minutes never exceeded 40 cc. in the fasting state.

For these experiments a model of duodenal drainage was employed. Perfusions of the artificial duodenum established three facts:

1. The physiological conditions simulated by the model slightly reduced the pure physical efficiency of the tube.

2. Despite this reduction, the drainage efficiency of the model was still *greater than the natural secretory inflow.*

3. The drainage proved so perfect that this inflow (30 cc. in thirty seconds) *passed through with no or very slight visible dilatation of the balloon.* Thus, the perfusion experiments in the model showed that *an inflow greater than the natural secretory inflow was removed so quickly that practically no accumulation occurred.*

Intraduodenal pressure is the resultant of the intra-abdominal pressure and the elasticity and contractility of the duodenum. An apparatus similar to the model was introduced into the human duodenum. It was found that the result of the perfusion carried out in the duodenum, itself, was the same as that of the extrinsic perfusion of the model. *The intraduodenal pressure did not reduce the drainage efficiency* below the level which is required for quantitative drainage. In the preceding extrinsic experiment no dilatation of the balloon was observed with inflow volumes less than 30 cc. per thirty seconds, and it may be assumed that *this inflow passed through the duodenum without accumulation and dilatation.*

The crucial point of the problem is whether part of the duodenal secretion escapes downward into the jejunum. This problem has not been examined previously. To study this simultaneous drainage from the duodenum and jejunum a Levin tube was used to obtain the duodenal secretion and a Miller-Abbott tube to occlude the first portion of the jejunum. It was found that only after suction was interrupted was there drainage of duodenal fluid from the jejunum.

In the correlation of these findings with the concepts of physiological activity of the duodenum as presented in the literature, the authors found that adequate drainage is so efficient, if suction under specified conditions is used, that those physiological factors which theoretically would be expected to oppose quantitative duodenal drainage actually do not prevent it.

The drainage was efficient when a Levin tube was used with multiple spiral openings, when "simple duodenal syphonage" was employed, when the outflow end was fixed at 35 cm. below the estimated level of the duodenum, and when continuity and constancy of suction was maintained. Quantitative efficiency of duodenal drainage can be achieved without an obstructing balloon in the jejunum.

During adequate drainage the duodenum seems to be permanently empty, and no accumulation of fluid occurs in it at any time. Thus, an important stimulus of peristaltic activity is absent, and even if peristalsis should occur there is no fluid mass present to be moved on.

The article contains several diagrams, tables, and a full description of the techniques employed. The bibliography presents a large amount of literature on this subject. JOHN E. KIRKPATRICK, M.D.

GYNECOLOGY

UTERUS

Pecorone, R. A.: A Contribution on the Study of Human Uterine Motility In Vivo (Contribución al estudio de la motilidad uterina humana "in vivo"). *Rev. Soc. argent. biol.*, 1943, 18: 472.

The author has made a study of the uterus *in vivo* by recording its contractions in various phases of the menstrual cycle. Most of the observations were made on the normal organ; however, a few studies were undertaken in organs of the hypoplastic variety and in those affected with fibromas. Uterine contractions were also studied before and after the injection of pituitary extract.

Contractions were recorded by means of a kymograph, associated with a mercury manometer, and the activity of the uterus was transmitted to this apparatus by introducing a balloon into the uterine cavity and connecting the balloon with a rubber tube. The author reproduces several of his kymographic records along with a diagram of the apparatus.

A total of 25 patients was investigated and a total of 32 recordings was made on this group. The patients were divided into four groups.

Group I. Women with a normal menstrual history and studied during the proliferative or first half of the menstrual cycle. This group demonstrated uterine hypertonic contractions and contraction rhythm of 3 to 5 per minute. Pituitary extract produced contractions of only slightly increased intensity.

Group II. A group of 11 women whose uterine contractions were studied in the latter half of their menstrual cycle. This group demonstrated uterine contractions of increased amplitude at two to three minute intervals, and a contraction duration of thirty to one hundred and twenty seconds. The administration of pituitary extract in this group was followed by a more marked response.

Group III. Six women with irregular menstrual history were investigated and the uterine activity was found not unlike that of the normal groups studied and recorded above.

Group IV. A group of 4 women who presented evidence of uterine hypoplasia and fibroma portrayed a definitely diminished uterine activity and the response to pituitary extract was diminished.

ROBERT LICH, JR., M.D.

Sanders, R. L.: Endometriosis. Clinical and Therapeutic Considerations. *Surgery*, 1943, 13: 224.

After more than twenty years of fairly intensive investigation, endometriosis still holds the interest of physicians and surgeons. In the first place its cause remains largely a matter of speculation. Its pathological and clinical manifestations continue to defy recognition. Finally, the proper methods of its treatment are still disputed. The condition is far more prevalent than the profession in general yet realizes. Chiefly responsible for this fact, no doubt, is its common association with adenomyosis and other pelvic diseases; the surgeon is easily deceived into attributing the patient's symptoms to one or more of these disorders and overlooking entirely the possibility of endometriosis. In this article the author presents the clinical and therapeutic features of endometriosis, together with a critical review of his own cases seen within recent years.

A history of the opinions regarding the mode of origin of endometriosis is presented and discussed. The theory of Sampson is that the masses develop from bits of mullerian mucosa deposited on the peritoneum by retrograde menstrual flow and that they either remain superficial or invade and contract the underlying structure. After invading the ovary they enlarge and give rise to a cyst, which ruptures and in turn disperses other implants over the pelvic structures. The second theory is that the process develops by metaplasia of celomic epithelium. It is generally believed that the basic factor is a glandular imbalance which results in overactivity of the hormones.

The author describes in general the pathology in endometriosis. He describes also the symptoms, the cardinal features of which are menstrual irregularity and pelvic pain. The menstrual disorder is usually a menorrhagia or metrorrhagia. The pelvic pain may be general, or localized on one side. It may be referred to the back or down the thighs. Some patients may have neither menstrual disorder nor pain. Many of them complain of symptoms involving the gastrointestinal or the urinary tract, or of vaginal discharge, nervousness, loss of appetite and weight, headache, and dyspareunia.

The most reliable diagnostic measure is rectovaginal examination. By this means, fixed, painful, nodular masses in the uterosacral ligaments, in the cul-de-sac, or on the rectovaginal shelf may be readily detected. When present they may be regarded, practically without doubt, as endometriomas. Especially significant in the diagnosis is the fact that symptoms are exaggerated during menstruation. The patient may have no difficulty whatever except menstrual pain.

In the opinion of the author, the treatment of endometriosis is entirely surgical. If the implants are extensive and both ovaries are involved, all of the pelvic organs should be extirpated. When only one ovary is affected, however, and all the peritoneal implants are removable, the good ovary may be left undisturbed. The principal aim in any case is the relief of symptoms and prevention of further damage by interruption of the disease. If this cannot be accomplished without completely destroying ovarian function, the radical operation should be carried out.

The use of radium or x-ray therapy in endometriosis seems hardly justifiable. In any case irradiation should never be given until the abdomen is opened, and then not until the evidence of endometriosis is definitely proved by thorough exploration.

The author presents 120 cases of pelvic endometriosis discovered at operation in a total of approximately 700 laparotomies for gynecological diseases. This number represents an incidence of 17 per cent.

A critical review of the study of these 120 cases in patients of different age groups is presented together with a tabulation showing: (1) the incidence of endometriosis and disease of the uterus and cervix; (2) the incidence of mild and severe endometriosis; (3) the duration of symptoms; and (4) the results of operation. The author observes that one needs merely to review the reported incidence of endometriosis as diagnosed in our hospitals, and compare it with the incidence in private clinic practice, to appreciate the fact that it is recognized in only a small proportion of cases. This fact certainly calls in forceful terms for a better understanding and a wider recognition of this disease.

HERBERT F. THURSTON, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Rydberg, E., and Pedersen-Bjergaard, K.: The Effect of Gonadotropins on the Ovary. *J. Am. M. Ass.*, 1943, 121: 1117.

Serum gonadotropin and chorionic gonadatropin were administered alone and in combination in varying doses to patients with amenorrhea. The excretion of estrogens, and in some cases, of sodium pregnandiol glycuronate was quantitatively determined before and after treatment. Examination of the endometrium was also done. Fourteen charts are presented to illustrate in detail the therapeutic experiments of the authors.

In cases of failing ovarian function the gonadotropic preparations were found to produce an adequate reaction in the ovary followed by menstruation. By a suitable dosage it was practicable in most cases of secondary amenorrhea to set the ovarian function going at least temporarily, and often permanently.

It was found that adequate stimulation of the human ovary to activity similar to the normal spontaneous process, i.e., beginning with follicular stimulation and going on to luteinization, was best obtained by a combined treatment commencing with serum gonadotropin. It is recommended that 3,000 international units of serum gonadotropin be given daily by intramuscular injection for five consecutive days and then 1,500 international units of chorionic gonadotropin be given every day for three days. In reacting patients menstruation occurred about ten days following the last injection.

HENRY C. FALK. M.D.

Schenken, J. R., and Burns, E. L.: A Study and Classification of Nodular Lesions of the Fallopian Tubes. *Am. J. Obst.*, 1943, 45: 624.

Three hundred and twenty-nine nodules in the walls of fallopian tubes of 208 patients were studied. Eighty-one and seven-tenths per cent of the nodules were due to diverticula of tubal epithelium alone or in association with acute or chronic inflammatory lesions. The authors have suggested the term "diverticulosis of the fallopian tubes" for these types of lesions. Eleven and two-tenths per cent of the nodules were due to inflammatory lesions without diverticulosis; 6.7 per cent were due to endometriosis, and 0.3 per cent were due to metastatic carcinoma of the endometrium.

EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Abarbanel, A. R., Aranow, H., and Goodfriend, M. J.: Adjunctive Therapy with Diethylstilbestrol. *J. Am. M. Ass.*, 1943, 121: 1123.

Diethylstilbestrol, a nonsteroidal chemical substance, is a constitutional drug possessing among other properties potent gynecogenic activity. Diethylstilbestrol should not be used alone but as part of a rational regime which includes adequate treatment of all physical and mental symptoms. Its adjuvant therapeutic merit is evaluated upon the personal experience of the authors in over 700 cases, as well as upon the extensive clinical reports in the literature.

In almost 50 per cent of patients with severe climacteric vasomotor instability, the use of diet, sedation, reassurrance, and thyroid was adequate for the control of symptoms. In the remainder adjunctive therapy with diethylstilbestrol gave satisfactory results in over 92 per cent of the cases. The initial daily dose was from 0.1 to .25 mgm. and this was increased or decreased according to the response obtained.

Diethylstilbestrol may also be of definite value in the adjunctive therapy of the following conditions:

1. Essential senile vulvovaginitis, including generalized essential senile pruritis. Local therapy with an ointment containing 5 mgm. of diethylstilbestrol to the ounce is the most efficient means of administration.

2. Juvenile (gonococcal) vulvovaginitis. The use of suppositories containing 0.1 mgm. of diethylstilbestrol, or the oral administration of .1 mgm., one to three times daily, may be effective.

3. Puerperal painful engorgement of the breasts. This syndrome results from lymphatic and venous stasis and not from distention of the ducts with milk. From 5 to 25 mgm. daily are administered orally to prevent painful engorgement; the relief of painful engorgement requires the oral administration of from 25 to 50 mgm. daily.

4. Amenorrhea, secondary or primary; cyclic administration of diethylstilbestrol is recommended.

The adjuvant use of diethylstilbestrol has shown promise in preliminary clinical trials in the management of the induction of labor, missed abortion, missed labor, and uterine inertia due to myometrial dystonia. It produces a sensitizing or priming action of the uterine muscle to the subsequent action of potent oxytocics. It may also be of value in the prophylaxis of post-partum and post-abortal infections.

The use of diethylstilbestrol is of no value for (1) the induction of early abortion, (2) the suppression of lactation, and (3) the treatment of galactorrhea. It is of very limited value in the management of primary dysmenorrhea.

According to the authors, an analysis of gastrointestinal side reactions to diethylstilbestrol, especially in climacteric patients, reveals the following information:

1. The higher the dose level, the greater the incidence of nausea.

2. The relative estrogenic potency of the substance in question must be considered in evaluating side reactions.

3. Nausea may be an incidental or a true side reaction, according to the patient.

4. Patients with a previous history of sensitivity to fried and fatty foods are much more prone to develop nausea at any given dose level than those who had a previously negative gastrointestinal history.

5. Pregnant and puerperal patients, including those with a pronounced toxemia, and even eclampsia, and with evident cardiorenal and hepatic damage, may easily be given orally as much as 250 mgm. of diethylstilbestrol a day without evident side effects.

HENRY C. FALK, M.D.

Barrett, C. W.: Hernioplastic Operations on Rectum and Pelvic Floor. *Am. J. Surg.*, 1943, 59: 519.

The author describes and discusses the anatomy of the pelvic floor in its relationship to prolapse of the rectum. He presents a treatment for rectal prolapse and notes that the treatment should be based upon a proper conception of the anatomical condition. If the treatment for prolapse of the rectum is directed at the bowel condition, the pelvic floor will be overlooked. If the condition is regarded as a herniation, the abdominal wall and the pathological status of the bowel will receive joint consideration. In a rectal prolapse, there are all of the requirements of a hernia; a weakened wall and a gut pushing through. A hernioplastic repair of the pelvic floor is necessary.

An intrasphincterian hernioplastic operation upon the pelvic floor and sphincter, combined with amputation of the herniated portion of the bowel is described. The history of such a case in a male, fifty-one years old, with a successful result is discussed.

The author notes that the hernioplastic operation to cure rectocele is performed by raising the posterior vaginal flap and bringing the pelvic floor muscles and fascias together. Care should be taken to have the sutures reach far enough backward to get the muscles anterolateral to the rectum, in order to reduce the size of the cleft through which the rectum passes. Another precaution is to see that the anorectal structures are well attached to the supporting pelvic floor. In extensive bulging of the anterior rectal wall, transverse plication of the anterior rectal wall is recommended. It is of greatest importance to use the muscles and fascias to reinforce such bulging rectal walls.

HERBERT F. THURSTON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Taylor, H. C., Jr., Warner, R. C., and Welsh, C. A.: The Relationship of the Estrogens and Progesterone to the Edema of Normal and Toxemic Pregnancy. *Am. J. Obst.*, 1943, 45: 547.

The data obtained from 5 previously reported cases in which the sodium balances were studied during late pregnancy and the early puerperium without hormone administration were used as controls. The authors then reported 5 cases in which the patients were given hormones, either estrogen or progesterone, immediately after delivery in an effort to prevent or modify the sodium loss and diuresis of the early puerperium. In 3 of these cases large doses of hormones were also given during pregnancy in order to determine whether the sodium balance was in any way disturbed by such treatment. The sodium balance of the 5 hormone-treated patients showed, with certain exceptions to be noted, the general trends observed in the cases previously reported. These consisted in a constant retention of sodium until the time of delivery, with a negative balance appearing after parturition and reaching its greatest magnitude from the third to the fifth day. The days of greatest sodium loss corresponded in general with the return of the urinary estrogen to nonpregnant levels.

Attempts to maintain in the puerperium levels of estrogen or progesterone characteristic of pregnancy failed. The general tendency of normal pregnant women to retain sodium and water appears, however, to be best explained by the fact that they are constantly under the influence of enormous quantities of the steroid sex hormones. This effect is so predictable from the known physiological properties of these substances that were the tendency to sodium and water retention not present, one would have to find an explanation for its absence.

The increase in the tendency to sodium and water retention which takes place with the onset of toxemia does not, however, find a complete explanation on the basis of a further rise in hormone effectiveness. The sudden appearance of proteinuria and of hypertension, and the change from hydremia toward hemoconcentration indicate that a new mechanism is at work. Furthermore, as in most cases of preeclampsia the rates of steroid sex-hormone excretion are not increased, but probably continue to contribute to the sodium retention in toxemia, the greater edema of that disease cannot be considered simply an exaggeration of that found in normal pregnancy.

During pregnancy the administration of what would now be regarded from the clinical standpoint as large doses of estrogen and progesterone had no demonstrable effect on the sodium balance. It is believed that in relation to the enormous quantities of hormone produced daily by the pregnant woman, the administered quantities were actually small, perhaps physiologically insignificant.

EDWARD L. CORNELL, M.D.

McLaughlin, C. W., Jr., and McGoogan, L. S.: Hyperthyroidism Complicating Pregnancy. *Am. J. Obst.*, 1943, 45: 591.

A series of 19 cases of hyperthyroidism complicating pregnancy are reported. The incidence of pregnancy in established thyroid disease is over three times as high as the incidence of hyperthyroidism developing during pregnancy.

The thyrotoxicosis was definitely aggravated by the pregnancy in 74 per cent of the series, increased in 21 per cent, and unaffected in 5 per cent. Toxemia of pregnancy, varying in degree, occurred in 62.5 per cent of the 8 patients admitted during the third trimester.

Eleven patients were treated conservatively and 8 underwent surgery for their thyroid disease prior to delivery. One fetal death occurred, and there were 2 maternal deaths in this series.

Both maternal deaths occurred in patients with adenomatous goiter and hyperthyroidism, which confirms the opinion that this is the most serious type of thyroid disease complicating pregnancy. Thyroidectomy is a safe surgical procedure during pregnancy and should be undertaken at any stage if conservative treatment does not control the thyrotoxicosis. The treatment of the patient with hyperthyroidism complicating pregnancy should be individualized. Surgical interference will be necessary more frequently in patients with adenomatous goiter and hyperthyroidism than in those with primary exophthalmic goiter.

EDWARD L. CORNELL, M.D.

Peelen, J. W.: Pregnancy Complicated by Acute Anterior Poliomyelitis. *J. Michigan M. Soc.*, 1943, 42: 30.

Twenty-nine cases of pregnancy complicated by acute anterior poliomyelitis reported in some detail have been reviewed, and 2 new cases have been added. In addition, 28 cases are incompletely reported.

Acute anterior poliomyelitis, being an infectious disease, immediately raises many questions and the most important conclusions obtained from this study are:

1. The usual course of pregnancy does not change.
2. Poliomyelitis is seen most often in the latter part of pregnancy.
3. The type of paralysis and complications will determine whether interference with the pregnancy is necessary—in some instances, particularly when the respiratory muscles have been affected, the condition is improved by terminating the pregnancy.

4. It has not been proved that intrauterine poliomyelitis occurs, no well substantiated case ever having been reported.

If, as seems probable, the virus does not circulate in the blood, the fetus should logically escape.

DANIEL G. MORTON, M.D.

Tucker, W. B., and Bryant, J. E.: The Problem of Unsuspected Tuberculosis during Pregnancy in the Negro. *Am. J. Obst.*, 1943, 45: 678.

One thousand consecutive patients attending the Prenatal Clinic of the Provident Hospital and Training School, Chicago, were examined for pulmonary tuberculosis by fluoroscopy and x-rays. Eighteen cases, 1.8 per cent, of unsuspected clinically important tuberculosis and 11 additional cases, 1.1 per cent, of clinically unimportant reinfection tuberculosis, a total of 29 cases, or 2.9 per cent, were found by this technique. This incidence was found to be approximately the same as for other nonpregnant women of the same age groups examined at Provident Hospital. These findings are compared with those reported by Eisele and associates at the Chicago Lying-in Hospital, where the incidence of unsuspected clinically important tuberculosis was 1.0 per cent.

It is concluded that the difference is probably due more to the different economic and social status of the two groups than to race, or to a slight difference in the age distributions. The finding of so high an incidence, especially in the negro in whom tuberculosis tends to run a more unfavorable course, serves to confirm the contention that routine chest roentgenological examinations should be an indispensable part of the prenatal care of negro pregnant women.

EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Moore, W. T., and Steptoe, P. P., Jr.: The Experience of the Johns Hopkins Hospital with Breech Presentation. An Analysis of 1,444 Cases. *South. M. J.*, 1943, 36: 295.

In 50,255 deliveries of infants weighing more than 1,500 gm. there were 1,444 breech presentations—an incidence of 2.8 per cent. Over 95 per cent of the breech deliveries were done by members of the resident staff and the remainder by senior staff members on the private service.

The incidence of complete breech presentation was about the same in infants under 2,500 gm. and in those over 2,500 gm. (9.38 per cent and 7.66 per cent, respectively). However, frank breech presentation occurred in only 48.16 per cent of the premature infants as compared with 63.16 per cent of the infants weighing more than 2,500 gm. at birth. Footling presentation was almost twice as frequent in the premature group as in the term infants.

Contracted pelvis and other conditions which prevent engagement of the head were less commonly noted as causing breech presentation than prematurity, fetal malformation, and placenta previa.

After all cases of placenta previa, fetal syphilis, and intrauterine death occurring before the patient was admitted to the hospital are eliminated, the fetal mortality was 12.8 per cent. Prolapsed cord was diagnosed 70 times (4.85 per cent), the incidence in frank breech presentations being 0.41 per cent, but this was 22 times more frequent in footling presentations. This complication was responsible for 20 per cent of the deaths of 951 infants. Other factors which were associated with high fetal mortality, were primiparity, race (twice as high in colored as in white patients), prolonged labor, contracted pelvis, and infants weighing more than 4,000 or less than 2,500 gm.

Prior to 1932, extraction was done only if some complication prevented spontaneous delivery of the infant. Consequently, the mortality rates for this procedure were higher than for spontaneous delivery to the umbilicus. Since that time elective extraction has been done on certain cases with a fetal mortality rate of 5.1 per cent as compared to 4.5 per cent for those allowed to deliver spontaneously to the umbilicus. The application of forceps to the aftercoming head was associated with a mortality rate of about half of that when no forceps were used (3.65 per cent and 6.14 per cent, respectively).

The authors conclude that prenatal care, close observation during labor, conservatism during delivery, episiotomy, and forceps to the head will decrease the fetal mortality.

J. ROBERT WILLSON, M.D.

Moran, R. J.: Successful Post-Mortem Cesarean Section. *N. England J. M.*, 1942, 227: 988.

Because of the relative rarity of cases of successful post-mortem cesarean section, in the medical literature, it is thought worth-while to note the report of this case:

The patient was a twenty-four-year-old gravida-iii para-i. On entry she was slightly less than seven months in gestation. Physical examination revealed a well developed, obese white woman lying propped up in bed, wheezing and coughing. The temperature was 100.4°F., the pulse 134, and the respirations 36. Both lung fields were diffusely filled with fine moist expiratory rales. The fetal heart was audible. Sputum typing and blood culture were immediately done, and both were reported positive for the Type 3 pneumococcus.

In spite of constant and energetic measures to restore the patient, she failed to rally, and preparations were hastily made for a post-mortem cesarean section. Terminally the respirations became short gasps with long intervals of apnea. The oxygen tent was kept going continuously, and the patient's color remained good. She was pronounced dead at 3:24 a.m., no fetal heart sounds having been heard for about four and one-half hours. About twenty seconds later the abdomen was opened by a single midline incision, and the uterus sagged forward. The fundus was opened and the baby was delivered manually. Alpha-lobeline was injected into the umbilical cord.

which was apparently pulseless, and within a few seconds respirations were established.

At birth the infant weighed 3 lb. 6 oz. After an initial loss of 2 ounces in weight she made uneventful progress. She left the hospital after seven weeks, weighing 6 lb. and is at present in good health.

DANIEL G. MORTON, M.D.

NEWBORN

Potter, E. L., and Rosenbaum, W.: The Normal Amount of Cerebrospinal Fluid Present within the Skull at Birth. *Am. J. Obst.*, 1943, 45: 701.

The amount of cerebrospinal fluid found within the cranial cavity at the post-mortem examination of 170 selected infants and fetuses is reported. The amount increased gradually from 7 cc. in the weight group of from 250 to 500 gm., to 23 cc. in the weight group of from 1,500 to 1,750 gm. Thereafter it fell abruptly, and in all infants and fetuses weighing over 2,000 gm. practically no fluid could normally be demonstrated by the method used.

EDWARD L. CORNELL, M.D.

MISCELLANEOUS

Jones, G. E. S., Gey, G. O., and Gey, M. K.: Hormone Production by Placental Cells Maintained in Continuous Culture. *Bull. Johns Hopkins Hosp.*, 1943, 72: 26.

Human placental cells have been grown in continuous cultures in roller tubes. The specimens cultured were 5 three-month placentas, 2 placentas of ectopic pregnancies, 2 full-term placentas, and 3 hydatidiform moles. Aschheim-Zondek tests were performed on the supernatant cell-free fluid media which were removed at different intervals after primary explantation and after having been in contact with the living placental cells for only three or four days. Fourteen tests of the 29 which were performed were positive for cyonin (chorionic gonadotropin) as judged by the presence of corpora lutea in the twenty-one-day-old rat ovary. Marked increase in the size of one or more follicles was observed 6 times and weak follicle stimulation once. Four assays were negative. Control tests carried out on various constituents of the medium used and on media from human muscle and thyroid cultures were negative.

Ten estrogen assays, performed by the six-hour Astwood method failed to demonstrate any consistent increase in the amount of estrogen present in the placental as compared with the control tissue culture medium. Hydrolysis of the fluid did not increase the estrogenic activity. Tests for progesterone failed to indicate that this hormone was present in amounts sufficient to obscure an estrogen effect. Estradiol was not destroyed by incubation with placental cells growing in tissue culture.

The type of cells apparently responsible for the production of cyonin are the Langhans' cells. These cells will produce cyonin under conditions found in continuous tissue cultures and may retain this capacity as long as six months in culture. It has not been possible to demonstrate that placental cells can produce estrogen under similar circumstances.

DANIEL G. MORTON, M.D.

Hertig, A. T., and Sheldon, W. H.: Minimal Criteria Required to Prove a Prima Facie Case of Traumatic Abortion or Miscarriage. *Ann. Surg.*, 1943, 117: 596.

The purpose of this article is to examine and put forth the factual relationship between trauma and abortion, or miscarriage. Abortion is the premature expulsion of a nonviable fetus or ovum. In the broadest medical sense the term abortion includes all previably delivered ova, although in a more restricted sense it refers only to the first fifteen weeks of gestation. Traumatically caused abortions are rarer than supposed. The authors analyze a series of abortuses examined in the pathological laboratory of the Boston Lying-in Hospital to prove this.

The period encompassed in the study is from February, 1936, to December, 1941. During this time a total of 1,416 consecutive abortuses were studied and 1,000 of these were selected as the base of this report. The criteria of selection were based merely on the completeness of both the clinical history and the pathological material submitted. Hydatidiform moles were excluded. The general technique used in the examination of this material is detailed in Mall and Meyer's classic work. There were 13 cases in which there was a history of trauma and these are reviewed in detail. It is the medical concensus that at least 10 per cent of all pregnancies terminate in spontaneous abortion, and that only rarely are such abortions caused by trauma.

The authors have only included pathological ova in which there were macerated embryos since these were anatomically normal, but had died in utero.

The following figures are a crude breakdown of the 1,000 cases with respect to the main embryological and pathological features shown in each specimen:

I.	Ovular Factors:		
	1. Pathological ova, with absent or defective embryos	489	
	2. Embryos with localized anomalies	32	
	3. Placental abnormalities	96	
			617
II.	Maternal Factors:		
	1. Criminal abortions	21	
	2. Uterine abnormalities	64	
	3. Febrile and inflammatory diseases	20	
	4. Miscellaneous	12	
	5. Anatomically normal ova (classified)	265	
	6. Trauma (automobile accident)	1	383
			1,000

In the entire series of 1,000 abortions there were 9 cases in which external trauma of some variety was recorded prior to expulsion of the ovum. Five patients proved, on pathological and embryological

examination, to have passed pathological or defective ova which would undoubtedly have aborted irrespective of any trauma, while 4 showed placental defects which caused the abortion.

A true traumatic abortion is one in which the abortus is anatomically normal in development up to the time at which the external trauma and/or psychic shock occurs. The time interval between the occurrence of the external trauma and/or psychic shock which initiates the sequence of events and the expulsion of the normal ovum may vary from minutes to hours.

In 1 case of a normal twin pregnancy abortion at twelve weeks and three days was the result of external trauma and/or the psychic shock resulting from an automobile accident; this case is reported in detail. LEROY J. KLEINSASSER, M.D.

Williams, T. J.: Hydatidiform Mole and Associated Tumors of the Chorion. *Am. J. Obst.*, 1943, 45: 432.

The author has records of 24 patients who passed moles, and in addition of 1 patient with a primary chorioepithelioma of the fallopian tube, and 1 case with a persistent positive Friedman-test reaction and uterine bleeding for three months after a normal pregnancy. Of the 24 patients with moles, 4 had them removed by hysterectomy and 20 passed them through the vagina. Thirteen of the 20 whose moles were delivered through the vagina had an uneventful recovery, although 1 of the patients had a spontaneous rupture of the uterus in a subsequent pregnancy, probably from a weak spot in the uterine wall as a result of invasion of the wall with chorionic tissue. Curettage in this patient two weeks after passage of the mole produced a large quantity of tissue, which was diagnosed as the product of syncytial endometritis. Four of the 20 patients whose moles were delivered through the vagina had a positive Friedman test following the delivery and were treated by hysterectomy; in 1 the diagnosis was chorioadenoma and in 3, syncytioma. All of these patients have survived. The 3 others who passed their moles through the vagina developed chorioepithelioma; all of the tumors developed before the use of the biological tests in the subsequent examination and observation of patients who have passed moles. The patients who had a diagnosis of chorioepithelioma died.

The problem which always presents itself is what course to pursue in the presence of a persistent positive test following the passage of a mole, an abortion, or a term pregnancy. The author has perhaps erred on the radical side, but the hope of removing or preventing a chorioepithelioma has possibly justified his course. This course has resulted in radical procedures for chorioadenomas and syncytiomas, the termination of a normal pregnancy, and, in 1 case, the inability to find any chorionic tissues in the removed structures. It is the custom in the presence of a persistent positive test to perform a curettage, and if a month or so later the test is still positive, an abdominal exploration of the pelvis with hysterectomy is advisable. EDWARD L. CORNELL, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Lowsley, O. S., and Cannon, E. M.: Aneurysm of the Renal Artery. Report of a Case. *J. Am. M. Ass.*, 1943, 121: 1137.

Aneurysm of the renal artery is a rare clinical and pathological entity. The authors found only 74 case reports in the literature and herewith add their own case of true aneurysm of the renal artery, which was diagnosed preoperatively.

The present case was that of a forty-seven-year-old white woman, complaining of persistent gnawing pain in the right flank. She had previously had two attacks of pyuria, chills and fever, and flank pain. Physical examination revealed no masses; there was slight right costovertebral tenderness and the blood pressure was 116/72. A diagnosis of calcified aneurysm of the right renal artery was made on the basis of a ring-like shadow with a denser periphery and rarefaction in its center, lying medial to and just above the right ureteropelvic juncture. Pyelography revealed no abnormalities of the kidneys proper.

At operation the right kidney and pedicle were exposed through the usual lumbar approach, and examination and palpation of the renal pedicle disclosed a faintly pulsating, small swelling in the region of the hilus of the kidney. The lesion was definitely identified as an aneurysm and nephrectomy was performed (Fig. 1). The patient made an uneventful recovery and has been entirely relieved of the dull flank pain which brought her to the hospital.

Pathological examination of the specimen showed a small saccular aneurysm 1.4 by 1.1 by 0.9 cm. at the bifurcation of the renal artery. The orifice of the aneurysm was located on the posterior aspect and its wall contained calcific atheromatous plaques. The kidney proper was grossly and microscopically normal. Microscopic section of the wall of the aneurysm revealed hyalinized collagenous tissue. Deposits of amorphous calcium salts were noted throughout the wall. The Weigert stain showed an absence of elastic tissue. The pathological diagnosis was true aneurysm of the right renal artery.

A congenital defect in the wall of the renal artery, particularly at its bifurcation, is a hypothetical factor in the etiology of aneurysm. It is questionable whether trauma *per se* produces renal aneurysm. It is well known that arteriosclerosis and syphilis are important factors in the formation of aneurysm, but these diseases played a minor part in the series of cases reviewed. Only 4 cases in the entire group had syphilis while 12 had arteriosclerosis. Periarteritis nodosa, although occasionally generalized, displays a particular affinity for the renal artery, and a small number of cases have shown this lesion at autopsy.

Only 12 of the 75 reported cases were suspected prior to operation or death. Age apparently has little bearing on the lesion, for the youngest patient was nine months and the oldest eighty-two years. Of the 72 patients whose sex was stated, 40 were males and 32 females.

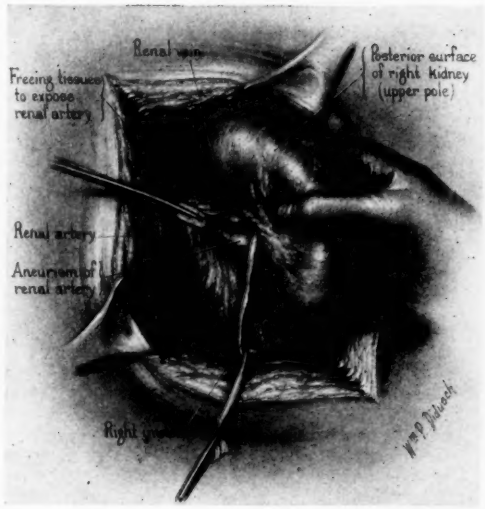
Renal vein
Freeing tissue to expose renal artery
Posterior surface of right kidney (upper pole)
Renal artery
Aneurysm of renal artery

Fig. 1. The right kidney has been exposed, showing aneurysm of the renal artery.

True aneurysm is usually asymptomatic. A few patients have complained of pain in the flank. The cardinal symptoms of false aneurysm are hematuria, pain, and tumefaction in the flank. The pathognomonic signs—pulsation and a systolic bruit—were present in 7 patients. The presence in the x-ray film of a ring-like shadow, with a dense periphery disrupted in one portion and a rarefaction of the center in the kidney or hilar region, is suggestive of a renal aneurysm.

The treatment of renal-artery aneurysm is surgical. In the literature all patients presenting symptoms who were not operated upon died. Of the 29 patients subjected to nephrectomy, 26 survived. Of 37 who underwent operation, 8 died—an operative mortality of 21 per cent.

ARTHUR H. MILBERT, M.D.

MacLean, J. T., and Deming, C. L.: The Incidence of Pyelonephritis in Successive Pregnancies. *J. Urol.*, Balt., 1943, 49: 236.

The authors present a statistical study of pyelonephritis associated with pregnancy in 68 patients who had undergone treatment in the Department of Urology of the New Haven Hospital, New Haven, Connecticut. Follow-up studies yielded interesting observations and conclusions.

It was found that the incidence of pyelonephritis diminished with each successive pregnancy. Two-thirds of all infections occurred during the first and second pregnancies. The incidence of infection increased each month and the maximum (33 per cent) was noted during the fifth and sixth months of pregnancy. The organism most commonly found was the colon bacillus, which was present in 36 of the 74 infections found in the 68 patients. Staphylococci were present in 9 cases. In the remaining cases the organisms were mixed, unidentified, or unreported. Cultures agreed with the stained smear in 72 per cent.

Complications or concurrent findings included single instances of double kidney and double ureter (bilateral), renal calculus, and anterior pyelonephritis. Death occurred in the case of 1 patient who was admitted to the hospital in extremis and was found to be dehydrated and toxic. This patient had refused hospitalization for the treatment of bilateral pyelonephritis and pregnancy.

By means of conservative measures, 85 per cent of the patients were carried to term, or until the fetus became viable, and of these, 90 per cent were delivered of living babies. The occurrence of pyogenic infection of the urinary tract during pregnancy was not an indication per se for abortion. The month of pregnancy at which the infection occurred and the ability of the pregnancy to reach term could not be associated in any way, when conservative methods of treatment were followed.

Mandelic acid and the sulfonamides were found to be superior to any other drugs used singly, since they were effective in combating a greater range of organisms.

Irrespective of the month of onset of the infection, treatment was continued until the patient was either 'cured" or delivered. Only 25 per cent of the patients were "cured" at term, yet within two weeks of emptying of the uterus 90 per cent were asymptomatic and free of infection.

The incidence of hypertension in the group of patients with infections associated with pregnancy was 27 per cent. This percentage is no higher than that which occurred in groups of patients with pyelonephritis uncomplicated by pregnancy. An acute upper respiratory infection immediately preceded the onset of the urinary infection in many of the cases. Dilatation of the ureter was likewise a common finding.

Correlating the observations of Browne on excretion of the gonadotropic substances, and of Kretschmer on dilatation of the ureter, the authors found that the incidence of pyelonephritis parallels that of ureteral dilatation, and both parallel the excretion of estrin and corpus-luteum hormone in the urine as the pregnancy advances. ARTHUR H. MILBERT, M.D.

Dees, J. E.: The Use of an Intrapelvic Coagulum in Pyelolithotomy; Preliminary Report. *South. M. J.*, 1943, 36: 167.

A new technique for the operative removal of small renal calculi and calculous fragments is presented. An intrapelvic coagulum is formed by the simultaneous injection of clotting globulin and human fibrinogen into the renal pelvis. This coagulum theoretically incorporates within itself all free calculi present, regardless of size or location, and on withdrawal of the coagulum through a pyelotomy incision the stones are removed. The coagulum is apparently harmless to the kidney and, should any portion of the clot remain, it spontaneously disintegrates in between eighteen and twenty-four hours.

This technique has been used in 5 clinical cases of human nephrolithiasis without apparent ill effect. Although it is still imperfect and as yet in an experimental stage, calculi that probably would not have been removed by pyelolithotomy as usually performed have been removed by this means.

The laboratory and scientific investigations that have enabled the author to bring this technique of coagulum pyelolithotomy to its present stage of development have obviously wandered far afield from the realm of clinical urology.

JOHN A. LOEF, M.D.

Lord, J. W., Stefko, P. L., and Stevens, A. R.: On Bridging a Gap in the Ureter by Means of a Free Fascial Transplant over a Straight Vitallium Tube. An Experimental Study. *J. Urol.*, Balt., 1943, 49: 249.

Enlarging on the work of Lord and Eccle, the authors presented the results of experiments carried

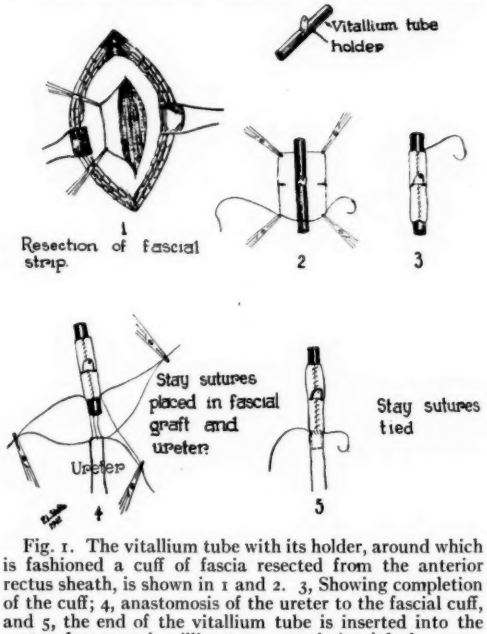

Fig. 1. The vitallium tube with its holder, around which is fashioned a cuff of fascia resected from the anterior rectus sheath, is shown in 1 and 2. 3, Showing completion of the cuff; 4, anastomosis of the ureter to the fascial cuff, and 5, the end of the vitallium tube is inserted into the ureter for several millimeters; completion of the anastomosis with continuous 0000 chromic catgut.

out in the dog to determine whether a gap could be bridged in the ureter with various tissues used as free transplants over a vitallium tube. It was found early in the course of the experiments that a smooth vitallium tube presented difficulties in remaining *in situ*. A holder was then devised as an attachment to the vitallium tube, which proved most satisfactory in keeping the free fascial grafts in position. When no holder was used, the tube slipped down the ureter and a stricture of the fascial graft occurred. Free peritoneal and free bladder grafts failed in every experiment because of the tendency to slough.

In 13 of 14 instances in which fascial grafts were used, they worked perfectly and there was never any extravasation of urine. The only failure was due to injury to the distal end of a small ureter in which excessive dilatation was necessary for insertion of the vitallium tube.

It was concluded that for surgery, vitallium is at present the most innocuous metal available for the construction of permanent, rigid tubes. Other metals or plastics may be in the offing, but, for the present, vitallium seems to answer the problem well in the urinary tract of the dog. Its limitations are that it must be cast, it is difficult to form it into curved tubes, it is not malleable, and it is not absolutely inert. STEPHEN A. ZIEMAN, M.D.

Pendergrass, E. P.: Excretory Urography as a Test of Urinary-Tract Function. *Radiology*, 1943, 40: 223.

As an introduction to this subject the author reviews some essential anatomical and physiological data of the kidney together with function tests which form the basis for estimating renal activity. He explains the term "clearance" as commonly used in these tests. Attention is called to the paucity of information correlating urographic studies of various conditions, other than anatomicopathological deformities of the urinary tract, with those of the clinician. Technical details of urography are discussed, and the information which may be obtained from it is given consideration.

As regards urinary-tract function, urography may be of value in estimating "clearance" by the roentgen appearance of the dye in various parts of the tract at stated intervals of time. In general, if the clinical tests of kidney function are not abnormal, dye clearance as determined by urography is very satisfactory. It has been determined that the rate of iodine excretion is roughly proportional to variations in urea clearance.

Cinex-camera roentgenography, as introduced by Jarre and Cumming, can contribute much to the knowledge of kidney physiology by demonstrating movements of the renal pelvis. Multiple exposures and films made in various positions can also give information of a similar nature. Kymograms of the tract may likewise be of value. Observations of the ureters during urographic examinations can disclose conditions which disturb transportation of the urine below the kidney which in turn will disturb the clearance of the contrast medium and the whole excretory mechanism of the kidney. The appearance, time, and density of the bladder dye will assist greatly in the determination of whether or not clearance is satisfactory. Studies after urination will reveal the effectiveness of bladder emptying, very little dye remaining if there is no obstruction. Intrinsic lesions of the bladder, as well as lesions of adjacent and spinal-cord structures, may not only produce dysfunction and deformities of the bladder, but secondarily cause dysfunction of the upper urinary tract. A. HARTUNG, M.D.

BLADDER, URETHRA, AND PENIS

Johnson, F. P.: Compromise Closure of the Bladder in Suprapubic Prostatectomy. *J. Urol.*, Balt., 1943, 49: 377.

The author suggests the use of small incisions in doing suprapubic prostatectomies so that the bladder will heal more rapidly and thus materially reduce the hospital stay of the patient. Vasoligation is routinely advocated and it is suggested that the method first reported by Davis is the method of choice. The method is shown in the illustrations.

It is thought that for the average suprapubic prostatectomy an abdominal incision of 1½ in. and a vesical opening slightly larger than is necessary for the introduction of the finger for enucleation are sufficiently large. The edges of the bladder are sutured to the edges of the rectus muscle to protect the prevesical space and these sutures are used for retraction.

The prostate is enucleated with the aid of a finger in the rectum and the gland is broken into its various lobes to permit extraction through the small vesical incision. Control of hemorrhage from the prostatic bed is accomplished through the use of a Foley or Pilcher catheter bag and traction on the bag is released in two hours to prevent ischemia of the tissues with the resultant delayed healing.

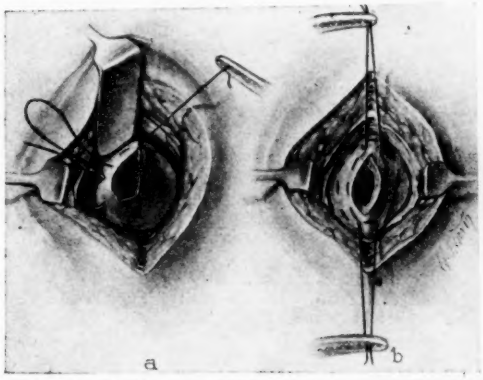

Fig. 1. Double purse-string suture surrounding the bladder incision.

Closure of the bladder is accomplished with the aid of two purse-string sutures (Fig. 1) placed so that one terminates superiorly and the other at the inferior angle of the wound. A 40 F. drainage tube is left in the bladder and the rectus sheath is closed about the tube while the skin is approximated with clips. The purse-string sutures of the bladder are left long and differently knotted for identification. When prostatic bleeding has subsided, which is usually within twenty-four hours, the drainage tube is removed from the bladder, and if a Pilcher bag is used, it too is removed and a Robinson 24 F. catheter introduced into the bladder through the urethra. When a Foley catheter is used this is, of course, unnecessary. The purse-string sutures are then tied and although there may be slight urinary leakage it is reported minimal and vesical healing is greatly enhanced. The urethral catheter is then removed in from five to ten days since the average vesical closure is complete in about four days. All patients have been ambulatory within from seven to ten days and were discharged within fourteen days after prostatectomy. ROBERT LICH, JR., M.D.

Fagerstrom, D. P.: Etiology of Acquired Diverticula of the Anterior Urethra and Its Relation to the Cause of Postprostatectomy Incontinence. *J. Urol.*, Balt., 1943, 49: 357.

The author reports 2 cases of anterior urethral diverticulum and reviews briefly 19 cases reported in the literature from 1900 to 1942. It is pointed out that the condition is produced by obstructive lesions, damage to the urethral wall, a combination of these factors, and in some instances probably by a disturbance of innervation of the urethra.

The author reviews the anatomy of the perineum and points out that it is possible that when the prostate is enucleated the nerve distribution of the adjacent portion of the anterior urethra is disturbed since the innervations of the prostate and urethra have a common origin. This theory is substantiated by the fact that instances of prostatectomy which are followed by incontinence may develop an adjacent anterior urethral diverticulum. The destruction of the nervous pathway may be due to the prostatic tumor or to the prostatic surgery.

The author was able to find 3 cases in the literature which were similar to the cases he reported, in which vesical incontinence followed prostatectomy and later a urethral diverticulum developed. Thus additional evidence is given the author's contention that there is some relation between the neurophysiology of the prostate and the perineal and urethral muscles. ROBERT LICH, JR., M.D.

Leberman, P. R., and Alexander, R.: The Use of Sulfathiazoline in the Treatment of Gonococcal Urethritis in the Male. *Am. J. Syph.*, 1943, 27: 187.

The present report has to do with a series of 88 cases of gonococcal urethritis treated under identical conditions with a new sulfonamide, sulfathiazoline.

Sulfathiazoline is a derivative of sulfanilamide in which an amide hydrogen has been replaced by a heterocyclic nucleus containing a nitrogen and a sulfur atom in the ring. It consists of colorless prismatic crystals which melt between 206 and 208°C. While it is slightly soluble in water, like similar heterocyclic products, it is more soluble in hot water as well as in an acid medium. The crystals can be sterilized by heating to 110°C. and solutions can be subjected to 15 lb. of steam pressure for a half hour without decomposition. The compound can be determined quantitatively in the blood, urine, and biological fluids by Marshall's method with a known sample of sulfathiazoline as a standard. The toxicity of sulfathiazoline seems to be slightly less than that of sulfathiazole.

As stated, the material consisted of 88 patients with gonococcal urethritis. The duration of symptoms before the first clinic visit varied from one to sixty days, and the patients were classified as having acute urethritis. Fifty-three had anterior urethritis and the remaining 35 had anteroposterior urethritis. There were 8 patients who had complications or complicating conditions existent at the time of their first visit to the clinic. Four patients who presented themselves for treatment had urethral stricture as a result of former infection. There were 2 with balanoposthitis, 1 with chancre, and 1 with paraphimosis. Forty-seven patients gave a history of having had from 1 to 5 previous attacks of neisserian infection.

The blood levels ranged from 0.6 to 4.0 mgm., but as these revealed no discernible relation to curative action, it is the opinion that they too, are not called for in routine work upon this disease.

In the present series of cases the dosage employed was 4 gm. a day in doses of 1 gm. each after meals and at bedtime for ten days.

The following provocative tests of cure were employed when the urine had remained clear from four to six days after disappearance of the symptoms:

1. Massage of the prostate and seminal vesicles
2. Passage of bougies or sounds
3. Consumption of alcoholic drinks
4. Sexual excitement
5. Cultures of urine containing prostatic secretion (at least 3 negative cultures) were obtained before cure was assumed.

Of the 88 patients treated with sulfathiazoline, 77 (87.5 per cent) were cured according to the criteria set up. Eleven (12.5 per cent) were uncured.

Of the 77 in whom cure was obtained, 70 responded to the first ten-day course of medication, while the remaining 7 required a second such course after a rest period of at least a week.

Among 53 patients with anterior urethritis only and who presented no complicating features on admission, there were 49 (92.4 per cent) of cures.

Among 35 patients with anteroposterior infection on admission, there were 28 cures (80 per cent).

Among the 7 failures (20 per cent) in this anteroposterior group, there were 4 patients with urethral stricture.

The average duration of urethral discharge after the beginning of medication in those patients registering a cure was three and two-tenths days.

Those patients remaining uncured were placed upon local treatment and responded well. In no case was it deemed necessary to resort to prolonged artificially produced fever.

In several of the patients classified as uncured, there was present the factor of poor co-operation by the patient, either by irregular visits to the clinic, the use of alcohol, sexual excitation, or irregular ingestion of the drug. One of them had a long-standing urethral stricture of small caliber.

JOHN A. LOEF, M.D.

GENITAL ORGANS

Wesson, M. B.: Peyronie's Disease (Plastic Induration), Cause and Treatment. *J. Urol.*, Balt., 1943, 49: 350.

The author briefly sketches the history of Peyronie's disease, referring particularly to Francis-cura de la Peyronie's original report in which no mention was made of the plaques lying between Buck's fascia and the tunica albuginea. It is noted that it is a disease particularly prevalent in men past forty and is related to sexual stimulation without gratification. Repeated trauma seems to be the most common etiological factor and is of two types: (1) internal trauma from prolonged priapism, and (2) external trauma from hampered vaginal penetration.

The usual pathological picture is that the plaque lies astraddle the corpora approximating either the glans or the pubis and situated below the dorsal vessels; however, the occurrence of bead-like formations either in the midline or on either or both corpora laterally is not uncommon. Fibrosis occurs early and remains stationary with eventual bony plaque formation. Malignant degeneration has not been reported. As to the theories of origin of these plaques the author mentions several: i.e., from the walls of small vessels, the tunica albuginea, Buck's fascia, or the surrounding connective tissue. The author considers the tiny microscopic hemorrhages

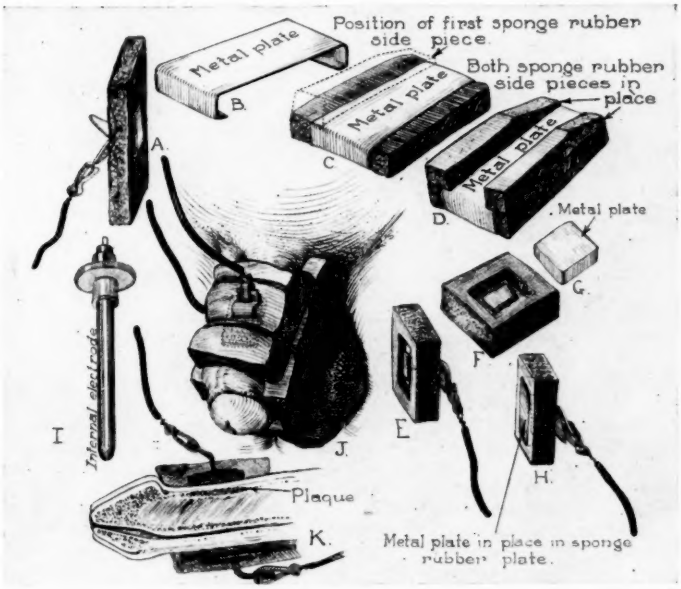

Fig. 1. A pair of penile electrodes made from sponge rubber and block tin. The large electrode lies below and supports the phallus, while the small one is placed directly over the plaque. The electrodes are held in place with rubber bands, *J* and *K*. If the edge of the tin comes in contact with the skin it will cause a burn, hence in the large one the ends must be bent under the rubber and the sides covered with "side boards" of rubber, *A-D*, while in the small one the tin can be bent so as to bury the edges in an excavation in the rubber, *E-H*. An internal electrode, *I*, can be made from a female sound, a rubber cuff controlling the depth of insertion, with the electrical connection at the exposed end. This is sometimes helpful in addition to, or in place of, the ventral electrode, *D*. The metal disc of the small electrode should be the same size as the plaque and placed directly over it.

as the nutritive media in which the adventitial cells of the ruptured vessels and adjacent connective tissue cells grow to form plaques. Bone and cartilage form in the final stage of development through a process of transition of the existent cells.

The therapeutic problem is discussed at length, and in the opinion of the author, the suggestion of use of the organ as suggested by Van Buren and Keyes plus self-administered diathermy is most efficacious. Surgery is considered generally inadvisable because of the frequent recurrence following this procedure and the production of impotence. It is mentioned that radiation generally produces scar tissue rather than its dissolution and therefore this therapeutic measure must be used with extreme caution. Medicinal therapy with disodium phosphate in conjunction with a low calcium diet is considered of some possible theoretical physiological benefit as it is hoped that some of the calcium of the plaque will be withdrawn.

The author advises patients to procure a diathermy apparatus and undertake an hour's treatment per day using as much heat as is tolerated in increasing ten-minute increments. The construction of the homemade electrodes is shown in the accompanying illustrations. It is emphasized that because of the low resistance of the phallus it is necessary that the diathermy apparatus be equipped with a "variable high-frequency choke." This thermal therapy is to be fortified with the use of the organ, which the author has found useful in his series of patients. Although the author administers disodium phosphate he believes that this medication is of value psychologically and is not a specific.

ROBERT LICH, JR., M.D.

MISCELLANEOUS

Shimkin, M. B., and Zon, L.: Absorption of Subcutaneously Implanted Pellets of Diethylstilbestrol in Men. *J. Nat. Cancer Inst.*, 1943, 3: 367.

It appears to be established that estrogenation and castration are effective measures in the palliative treatment of inoperable prostatic carcinoma. The use of diethylstilbestrol or diethylstilbestrol dipropionate has some advantages over castration, particularly in the ease of administration, the avoidance of a major surgical procedure, and the low cost. Moreover, approximately one-fourth of the patients with prostatic carcinoma do not respond to castration and in these cases estrogenation can be tried as a supplemental procedure.

The optimum dosage of stilbestrol in prostatic carcinoma has not been established, but a beneficial response is obtained by an average dose of from 1 to 2 mgm. per day.

The need for constant, protracted ingestion or injection of stilbestrol in prostatic carcinoma suggested the administration of the compounds in the form of subcutaneously implanted pellets.

Nine male patients with neoplastic disease were implanted subcutaneously with sterilized pellets of diethylstilbestrol. The subcutaneous implantations were made through a paracentetic trocar, after a small incision had been made through the skin in the seventh intercostal space at the posterior axillary line. The pellets were implanted at least 2 cm. away from the incision. The skin incision was approximated with sterile tape and healed within forty-eight hours. At intervals following the implantation, the pellets were removed, dried, and weighed in order to determine the absorption rate.

Inspection showed that during the first fifty days, from 40 to 60 per cent of the weight was absorbed from the 50 mgm. pellets and that in one hundred days from 70 to 90 per cent of the original weight was absorbed.

Thus, one 50 mgm. pellet of the compression and shape used delivered an average of 0.5 mgm. per day for fifty days and an average of 0.4 mgm. per day during a hundred-day period.

Enlargement of the breasts was a constant response in from five to eight weeks after the implantation of the pellets. No toxic reactions were encountered. The period of observation was insufficient to evaluate the effects of the therapy on neoplastic disease. Of 2 patients with carcinoma of the prostate, one had definite relief from pain within two weeks and the other showed a drop of the elevated serum "acid" phosphatase amounting to 40 per cent in five days and 90 per cent in forty days following the implantation of the pellets.

JOHN A. LOEF, M.D.

Law, W. A.: The Treatment of Lymphogranuloma Inguinale with Anthiomaline. *Lancet*, Lond., 1943, 244: 300.

Two hundred and twenty cases of lymphogranuloma inguinale were diagnosed and treated during eighteen months among both British and African troops in West Africa. All these occurred among previously fit soldiers serving in West Africa.

The early stage of the condition presents a small ulcer, papule, vesicle, or pustule appearing anywhere about the penis; it is painless and transitory. In this series the primary lesion was seen in 79 cases. Eighty-five per cent of the African cases occurred in circumcized men. In this series, the onset was usually within a week of exposure and lasted from five to twenty-one days. The actual "bubo" appeared from one to twelve weeks after exposure. In approximately 30 per cent of both European and African patients there was bilateral glandular involvement. Three patients had involvement of the cervical glands and several showed massive involvement of the inguinal or iliac glands. The Frei test and biopsy were depended upon for diagnosis.

Following Stammers' and Law's suggestion (1941), the author describes the four stages at which the patient may present himself. The first is that of a firm, usually tender, solitary gland which is not attached to the skin or deep tissues. A recent or healed primary lesion may be found. Histologically the primary lesion shows infiltration of the perivas-

cular lymph space of the derma by plasma cells, mononuclear leucocytes, large reticuloendothelial cells, and a few polymorphs. There is cuffing of the blood vessels, endothelial proliferation, and dilatation. In the lymph gland there is considerable "stuffing" of the follicles with lymphocytes, mononuclear cells, and giant cells, with an increase in the fibrous interconnective tissue.

The second stage is that of periglandular inflammation. Glandular enlargement is more apparent and widespread and periglandular infiltration is definite. The glands become fixed and coalesce, which results in a matted mass. Histologically, focal necrosis occurs at multiple sites throughout the gland with the production of what appear to be numerous small abscesses in the gland substance. An increase in the periglandular connective tissue with fibrosis and matting occurs with an increase in the vascularity.

In the third stage suppuration with softening of the gland mass is the essential feature. Sometimes an easily aspirated sticky yellowish fluid is formed, at other times the material is almost caseous, or is frankly purulent. The cavity may be unilocular or multilocular. The substance is sterile on ordinary culture.

In the fourth stage, the suppurative process has progressed farther with skin ulceration and fistula formation. Multiple fistulas may form and secondary infection take place.

Some cases may resolve spontaneously and some early cases respond to surgical excision. The author changed to the antimony compound, anthiomaline, which is 16 per cent antimony. At first this was given intramuscularly, but later it was given by intravenous administration. Injections were given two or three times weekly, starting with a dose of 0.5 cc. and increasing by 0.5 cc. up to 2.0 cc. for a maximum of 20 injections. When this drug was not available a freshly prepared 1 per cent solution of antimony tartrate in distilled water was used, 1.5 cc. increasing by 1.5 cc. to a maximum of 6 cc. given twice weekly. A mild pyrexia lasting from two to six hours after administration was the only complication noted with either drug, although there might be some discomfort or pain along the vein during the injection of the latter drug. Forty-five cases were treated with sulfanilamide in massive doses, but the author could see no advantage from its use; it had the added disadvantage that the patients had to be confined to bed, whereas with antimony the patients were ambulant and performed light duties. A larger percentage of relapses occurred among these cases than among those with the antimony therapy.

MARIAN BARNES, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Jaffe, H. L., and Lichtenstein, L.: Solitary Benign Enchondroma of Bone. *Arch. Surg.*, 1943, 46: 480.

A solitary benign enchondroma is a benign cartilaginous growth which develops in the interior of the affected bone and only involves a single bone. Usually the growth does not cause a distention of the bone noticeable on the outside. In some instances, however, a definite bulging of the cortex and overlying soft parts and skin is found. A benign enchondroma may undergo malignant degeneration (into a chondrosarcoma). This predominantly occurs in long tubular bones.

In the reported series of 28 patients 12 were males and 16 females and most of them were from ten to fifty years old. The history of the onset of complaints usually was one of a few weeks or months. In some cases complaints dated back to a year and a half. Finger phalanges were affected in 13 cases, metacarpal bones in 5, the humerus in 5, the femur in 3, the toe phalanx in 1 case, and the metatarsal bone in 1. Benign enchondromas of the tubular bones develop in the metaphysis and eventually involve a large portion of the shaft. They may even extend into the epiphyseal end in cases in which fusion of the epiphysis has taken place. As a rule, they do not tend to violate the epiphyseal plate.

Enchondromas develop from misplaced bits of cartilage which originate from the epiphyseal cartilage plate. This theory is based on findings at autopsies of cases of healing rickets in which cartilage fragments apparently derived from the cartilage plates have been found in the metaphysis of long bones. Scherer has found cartilage sheared off the cartilage plates in the shafts of femurs even in persons who have not had rickets.

The usual history given is that the patient was not aware of anything wrong until a local trauma was followed by pain and swelling. A roentgenogram then revealed a pathological fracture in the affected bone. Some patients report intermittent pain and swelling in the affected phalanx for a considerable time, but in view of the mildness of the complaints these signs were disregarded. As a rule, in patients in which the long bones were involved, complaints were of a more recent date.

Roentgenographically the enchondromas appear as a centrally or eccentrally (situated off to one side) located, oval-shaped, cloudy rarefication shadow. Vague trabeculations and densifications ranging from the size of a pinhead to that of the head of a match are seen. Sometimes still unhealed fracture lines are found. If eccentrically located they may cause bulging and thinning of the overlying cortex.

Solitary benign enchondromas are the most common solitary lesion affecting a phalanx. Giant-cell tumors very rarely affect the phalanges. Generally they affect the epiphyseal end of the bone first, in contrast to the enchondromas which start their development in the metaphyseal region of such bone. Enchondromas must be differentiated from bone cysts, which very rarely (if ever) occur in phalanges. If attention is directed mainly to the bulging cortex caused by enchondromas, the condition of the interior of the bone being overlooked, the tumors may be misdiagnosed as osteochondromas.

The only 2 solitary lesions found in the phalanges which may simulate enchondromas roentgenographically are squamous-epithelium-lined phalangeal cysts and ossifying fibromas. Both occur nearly always in the terminal half of the terminal phalanges of the fingers, a site which is rare for enchondromas. In metacarpal and metatarsal bones the enchondromas tend to be in the distal end of the shaft. In long bones the lesions are located centrally although a considerable portion of the shaft may be involved. Spotty or blotchy calcifications of the lesions are nearly pathognomonic for enchondromas. In the absence of the spotty calcifications, and if the lesions appear expanded and trabeculated, they strongly suggest a solitary focus of fibrous dysplasia or a bone cyst.

Sections of a bone harboring an enchondroma show its marrow cavity filled with bluish-white facetted cartilage tumor mass. Curettings from the interior of the lesion show fragments of bluish-white, firm or myxomatous hyaline cartilage. In some instances white cartilage and yellowish gritty tissue is found representing calcified and even ossified cartilage. The microscopic appearance of these lesions is described in detail. It is pointed out that the ground (interstitial) substance may be hyaline in part or throughout, and that the cells generally lie in lacunas. The ground substance may show mucoid degeneration or may appear edematous. In the attempt to differentiate a benign from a malignant lesion the cellular elements are the most important factors. Viable and not too heavily calcified areas should be selected for the examination, and fracture sites should be avoided. In benign enchondromas the nuclei are found to be consistently small, round, and dark-staining. The cytoplasm is pale and vacuolated. If one finds many microscopic fields showing several binuclear cartilage cells, many cartilage cells with plump nuclei, or cells showing mitosis, the growth is no longer a benign enchondroma. The evolution of a chondrosarcoma from a benign enchondroma usually is a very slow process, but it is by no means a rare occurrence.

The treatment of choice is conservative surgical intervention. Curettement, followed by chemical cauterization, collapse of the distended part of the cortical wall, and the introduction of bone chips or the insertion of a solid bone graft, is the usual surgi-

cal procedure. No recurrences were noticed except one. In that case a course of preoperative irradiation therapy had been given. The wound suppurated postoperatively and some bone chips were sequestrated. It is well known that heavily irradiated lesions in bone, if operated on, are very susceptible to infection. GEORGE I. REISS, M.D.

Ghormley, R. K., and Dockerty, M. B.: Cystic Myxomatous Tumors about the Knee; Their Relation to Cysts of the Menisci. *J. Bone Surg.*, 1943, 25: 306.

This article is based on the clinical records in 4 cases of unusual mucinous tumors of the knee joint and on a study by a pathologist of tissue obtained in these and other cases of tumor about the knee as compared with normal semilunar cartilages. In 2 of the 4 cases the condition probably represented cysts of the semilunar cartilage; in 1 of which an unusual amount of bony change was present. In the third case the condition probably represented unusually extensive development of a parameniscal cyst, and in the fourth case a true myxomatous tumor of the semilunar cartilage was represented.

Cysts of the semilunar cartilages apparently are not true neoplasms but represent the end-results of degeneration. Such cysts sometimes may be distinguished from other cysts in the region of the knee joint by the absence of endothelial lining.

McMaster, P. E.: Muscle Hernia of the Leg; A Study of 21 Cases and 38 Hernias. *U. S. Nav. M. Bull.*, 1943, 41: 404.

The author reports on thirty-eight separate muscle hernias occurring in 21 individuals. These hernias may occur without preceding direct trauma. There may be multiple, and they may be bilateral.

The common symptoms of muscle hernia of the leg are aching, cramping, and pain of the leg muscles. On the other hand, the lesions may be discovered accidentally. The diagnosis is made by physical examination which reveals a protruding mass, averaging from 1 to 2 cm. in diameter, which is usually found on the anterior or lateral aspect of the leg. The hernia or tumor is soft, compressible, and sometimes tender, and it may be associated with a sharply palpable defect in the underlying fascia.

Nine of the patients had a single hernia. Twelve had multiple hernias, which were bilateral in 5 cases. One patient had 3 hernias on one leg and 2 on the other, while another had 4 distinct hernias on one leg. The hernias were all of the tibialis anticus and peroneal muscles except one which involved the flexor profundus digitorum. Five of the hernias occurred on the lateral surface of the lower third of the leg where the superficial peroneal nerve pierces the fascia to become subcutaneous.

With the leg relaxed in the prone position the mass disappeared. Contraction of the involved muscles did not cause the masses to become more prominent although weight bearing invariably did so. Neither motor weakness nor sensory changes were noted. Several cases were diagnosed as varicose veins. Needle aspiration was negative and surgery showed a muscle hernia. Thirteen hernias in 8 patients were repaired surgically. Local anesthesia was used in all except 1. Strain and weight bearing of the leg was limited after surgery for from twelve to fourteen days. Satisfactory results were obtained in 9 of the 13 hernias. RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Hass, J.: A Subtrochanteric Osteotomy for Pelvic Support. *J. Bone Surg.*, 1943, 25: 281.

The initial stimulus for the employment of this procedure was obtained in the observation of a case in which a spontaneous pelvic support, by means of the lesser trochanter, had occurred. In a woman, aged forty-two, with an untreated bilateral congenital dislocation of the hips, roentgenograms revealed that the lesser trochanters on both sides articulated with the corresponding acetabula to form an excellent support. She had no complaints whatsoever except some limitation of adduction.

For the irreducible dislocation, the lesser trochanter method is most suitable, and is especially applicable to cases of anterior, lateral, or intermediate positions. Experience has shown that the lesser trochanter may be used as well in higher positions of the femoral head (luxatio iliaca), after a preliminary period of about two weeks of skeletal traction has drawn the lesser trochanter down to the level of the acetabulum. The use of the lesser trochanter is the method applicable in the great majority of irreducible hip dislocations, with the exception of those rather rare cases of a very high iliac position of the head which is so fixed that it cannot be brought down by any means. It is for such cases that the original Lorenz bifurcation or the Shanz osteotomy may be reserved. To avoid any disturb-

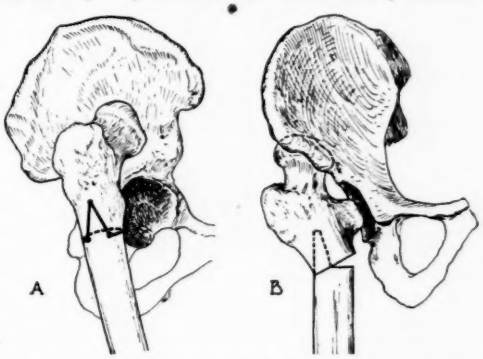

Fig. 1. A. Lateral view of a locking osteotomy performed by forming a triangular plug and slot in the outer surface of the femoral shaft beneath the lesser trochanter. B. Anterior view shows the divided femur and the lesser trochanter displaced into the acetabulum.

Fig. 2. A. Congenital dislocation of the right hip (luxatio supracotyloidea) in a woman, aged thirty-two years. B. Two years after the locking osteotomy, the lesser trochanter is displaced into the acetabulum. There is good pelvic support and a satisfactory range of motion.

ance of growth, the operation should not be carried out before the age of fourteen.

The operation consists of two parts: (1) a locking osteotomy beneath the lesser trochanter; (2) displacement of the lesser trochanter into the acetabulum.

The postoperative angle of abduction should not exceed from 30 to 40 degrees in unilateral cases, and should be limited to 10 or 15 degrees in bilateral cases. In other respects the position is neutral, except for a slight inward rotation of 10 degrees to compensate for a postoperative tendency toward outward rotation. Since the dislocated head is usually posterior, the osteotomy angle is also directed posteriorly to a slight degree. The position is checked by roentgenograms. The wound is then closed and a long spica which extends from the axilla to the toes is applied. In patients over twenty years of age, preliminary tenotomy of the adductor muscles may be necessary to overcome the contracture frequently associated with old congenital hip dislocations, and to prevent a loss of the abduction angle after the operation. Eight weeks postoperatively, the knee is freed and metal hinges are fixed to both sides of the plaster, so that the joint may be flexed. Walking is gradually resumed with the aid of crutches. As a rule, bony union at the site of osteotomy is sufficiently solid after three months to permit removal of the plaster and weight-bearing without support.

In cases of irreducible congenital dislocation of the hip the author has secured good stability and freedom from pain, as well as an adequate range of motion, by a method of pelvic-support osteotomy in which he uses a locking subtrochanteric osteotomy and displaces the lesser trochanter into the acetabulum.

Eighteen patients, of whom 4 had bilateral dislocations, have been treated by this method. The end-results, in the author's experience, are much better than those obtained by other methods. The pathological lordosis disappeared, the patients were free from pain, the Trendelenberg sign was negative, and the limp was scarcely noticeable. All patients had adequate motion with the exception of one who had had limited motion before operation.

ROBERT P. MONTGOMERY, M.D.

Linton, R. R., and Talbott, J. H.: The Surgical Treatment of Tophaceous Gout. *Ann. Surg.*, 1943, 117: 161.

The surgical treatment of tophaceous gout in 11 patients constitutes the basis of this report. The operations were carried out at the Massachusetts General Hospital, Boston. In the group of patients treated surgically, there were 10 males and 1 female. The ages ranged from twenty to eighty years. Eight patients were over fifty years of age.

Gout is a chronic metabolic disorder associated with an increased concentration of uric acid in the blood. Early in its course it is characterized with few clinical manifestations except acute attacks of arthritis. As the disease progresses osseous and subcutaneous urate deposits appear and lead to physical deformity and persistence of low-grade symptoms. Patients with advanced changes may be seriously handicapped and suffer needlessly because of the gradual increase in the size of the deposits. Since medicinal measures have been ineffective in treating these disabling tophi, recourse has been made to surgical treatment, with the expectation that considerable benefit would be obtained. The progressive course of the disease has been in no way affected but a lasting local benefit has been achieved that could not be produced by any other measures.

The surgical treatment of gout is applicable only to patients who have developed large tophaceous deposits. Less than 10 per cent of all gouty patients studied have needed surgical treatment. The indications for surgical treatment are believed to be:

1. Cosmetic reasons when tophi have become large and unsightly, such as in the subcutaneous tissues of the finger, the dorsum of the hand, forearm, or wrist.

2. Pain in tophi because of their location over exposed areas.

3. Interference with the movements of tendons or adjacent joints by tophi that involve the extensor or flexor tendons of the hand.

4. Any discharging sinus associated with a tophaceous deposit

5. Extensive phalangeal involvement of the fingers or toes with urate deposits

The tophaceous deposits which were removed during this study may be divided into three anatomical types:

1. Bursae and subcutaneous deposits which have involved only the tissues superficial to the deep fascia

2. Deposits which arise in tendons and which may or may not have involved adjacent tissues such as fat, fascia, bursae, and skin

3. Deposits which arise in joints with involvement of the bones, tendons, bursae, subcutaneous tissues, and skin

All of the tophi involving the soft tissues had a definite fibrous capsule which was thin and transparent but tough. It is thought to be formed from connective tissue and is, therefore, not a true capsule. It is believed that the pain in a tophaceous deposit associated with an acute attack of gout may result from the tension produced by the rapid deposition of urate crystals in a semifluid state within the relatively nonyielding fibrous capsule of the tophus.

The surgery must be by the most atraumatic method possible. Sharp dissection without pulling or stretching of the thin atrophic skin is essential. Transverse incisions are essential if sloughing is to be avoided. Tourniquets were used on fingers but not on toes because of fear of slough when arteriosclerosis was present. Closure of wounds must be done without creating tension or hematoma.

Tophaceous deposits may be removed by one of two methods. Complete excision of the tophus with its surrounding capsule is preferable. Currettage with a small bone curette was the second method. This latter method is used when the entire mass cannot be excised without damage to important structures involved by the process.

Local anesthesia was used many more times than other types but the wound healing was satisfactory with any of the anesthetics.

The results in these surgically treated cases as regards relief of pain, ulceration, unsightliness, and partial restoration of digital function was most satisfactory.

It is noted that any gouty patient undergoing a surgical operation is liable to an acute bout of gout. This holds whether articular or nonarticular structures are the sites of operations. The attack may appear within twenty-four hours after operation. These bouts may be greatly diminished in number and extent if 3 colchicine tablets (1/120 gr. each) are given each day for two days before operation and for three or more days following operation. This has decreased the percentage of attacks from 86 per cent in the untreated patients to only 10 per cent in the treated patients.

It is hoped that the results published in this article will encourage others to undertake surgery on similarly afflicted gouty patients. Since this series of cases shows that good results are possible by the surgical removal of tophaceous deposits even late in life, it is recommended that surgery be done earlier in the course of the disease than usually is considered desirable.

This article contains excellent color photographs and detail as to the care of these patients. It is suggested that it be read in the original before surgical treatment of gouty arthritis is attempted.

ROBERT T. MCELVENNY, M.D.

FRACTURES AND DISLOCATIONS

Pringle, J. H.: Traumatic Dislocation at the Hip Joint. An Experimental Study on the Cadaver. *Glasgow M. J.*, 1943, 139: 25.

While the caput might come to rest at any point around the acetabulum, primary dislocations of the femur were in the first place either anterior or posterior to the cavity, and in the second place either placed "high" or "low." This is quite a natural, and the best, classification to adopt.

It seems to the author in describing the relationship of the caput to the obturator internus, that it would be advisable to use the terms "dorsal" and "ventral," as they correlate the relationship of the caput to this muscle in every position of the body. Fifty dislocations were produced and examined by the author. All of these experimental dislocations were made by force alone; no interference with structures in or around the joints by incisions or removal of parts was made.

By comparison of the results obtained experimentally with post-mortem reports in accidental cases, and with the author's own clinical results, there was found to be close correspondence in the details of structural damage. Torsion of the capsule produced a tubular cuff disjoined at one or another attachment, sometimes with a portion of muscular tissue derived from one or two of the small deep muscles of the gluteal region, and together these prevented reduction; but when the muscle tissue was removed, the reduction was readily accomplished as the capsule caused no obstruction. In such complications, early operation for the removal of tissues and repair of the capsule would, therefore, deserve consideration. In high anterior dislocations, because of torsion from great violence, extensive laceration and avulsion of the muscles occurred around the joint, and the iliofemoral ligament became quite separated from the pelvis. In these cases, the psoas iliacus became the fulcrum on which reduction was effected, and probably this very strong muscle generally reinforces the action of the Y-ligament, and provides an interesting example of ligamentous action varying according to circumstances. It was found also that, added to the muscles alluded to, the adductors of the thigh may suffer considerably. The ultimate effect of these deep-seated lacerations around the joint in most cases seems to be slight or negligible.

Injury to the great blood vessels was rare; only on one occasion there was, in a clinical case, hematoma of Scarpa's triangle from injury to the femoral vein, with satisfactory recovery. These large vessels were never damaged experimentally at any time. The author could not satisfy himself that the sciatic nerve can receive serious injury by involvement with the femoral neck in direct manipulation or circumduction.

It is of interest to note a description of a diagnostic measure which may be found useful clinically: "When the subject is lying supine with the hip joint

extended and the foot vertical, a line drawn through the upper border of the pubic spine to the tip of the great trochanter and continued straight back (horizontal to the vertical plane) to the middle line will be found passing over the ischial spine or in very close relation to it." If one draws this line on the sound side in a suspected case and compares the position of the trochanters of the two limbs, one can obtain an approximate idea of the relative positions of the ischial spine and trochanter of the injured limb. The position of the caput in high posterior dislocations can always be recognized by palpation.

During the experiments several fractures of the femur occurred and frequently there was inclusion of muscular tissue between the posterior margins of the two main fragments, with the result that the author was led to do early operation on patients with these fractures in order to fix the fragments in proper position, with distinct advantage to the patients, he believes, for delayed union diminished in a notable manner as a result.

Photographs of dissections are presented. Pringle had completed his experimental researches on this subject, but at the time of his death the article had not been prepared in a form suitable for publication. The task of arranging the text and of selecting and explaining the illustrations was undertaken by Mr. Alexander H. Edwards, M.B., F.R.C.S., of Edinburgh. ROBERT P. MONTGOMERY, M.D.

ORTHOPEDICS IN GENERAL

Howorth, M. B.: The Evolution of Spinal Fusion. *Ann. Surg.*, 1943, 117: 278.

A discussion of the evolution of spinal fusion must necessarily begin with the names of Russell Hibbs and Fred Albee. Hibbs, in 1910, devised a method of using fragments from the spinous processes and laminae as a means of obtaining bony ankylosis. Albee used a graft of free bone from the tibia of the patient.

Hibbs had observed that nature tended to heal tuberculosis of the spine by a process of ankylosis of the lateral articulations, and occasionally of the laminae and spinous processes. This spontaneous ankylosis was, however, usually incomplete, it took years to develop, and usually it lagged behind the tuberculosis as it advanced up and down the spinal column. Hibbs reasoned that if ankylosis could be produced operatively, safely, and more quickly than would occur by the natural process, the complete splinting effect afforded thereby might result in more rapid and more certain healing of the disease. On January 9, 1911, Hibbs performed the first spinal fusion on a living subject, a boy with tuberculosis of the spine. The patient recovered from the operation without complications, bony ankylosis occurred, and the tuberculous lesion healed over a period of months. Hibbs reported the operation on this and 2 other patients on May 27, 1911. It is to be noted that in this report Hibbs stated: "In the very young, however, I think it will be necessary to graft bone from the leg. This is a perfectly practical procedure." Hibbs continued: "No case of lateral curvature has yet been done, but I propose to do exactly the same operation, and it it is not sufficient, to do an arthrodesis between the lateral processes." Previous to the operation for ankylosing the spine, Hibbs had performed an operation for stiffening the knee joint. This operation had led him to believe that the careful removal and resuturing of the periosteum over the spine was essential. This was later deemed desirable but not essential.

Fred Albee reported 3 cases in September, 1911. These cases had been treated by Albee during June and July of 1911. Albee stated: "Previous to the herein reported cases, five patients were operated on and three or four spinous processes were split . . . and the tip of the lower half of the superior vertebra was then brought into approximation with the tip of the superior half of the next lower vertebra after green-stick fractures of each, and fastened with heavy kangaroo tendon. Chips of bone from the apinous processes were then placed in between so as to insure further bone union between these vertebrae. This union has been satisfactory so far as can be ascertained," (this procedure is essentially the same as that described by Hibbs earlier in 1911) "but on account of its uncertainty and the large amount of cartilage in the vertebrae of small children, with its slowness of union and early lack of support, it has seemed best to devise a procedure which would be possibly more reliable and also give support from the beginning. These requirements can be fulfilled in no other way except by a strong bone graft. The different sources from which to secure a strong bone graft for an internal splint, which would give immediate support to the spine, were considered, and the crest of the tibia was selected as by far the most desirable and accessible." Albee implanted the tibial graft in the spinous processes.

Previous to these two men, Hadra, in 1891, had wired together the spinous processes in treating fracture of the spine. Lange, in 1902, had begun to use steel rods sutured in the angles between the spinous processes and the laminae. Later he substituted celluloid cylinders in a similar manner. In December 1911, DeQuervain and Hoessly, independently of a knowledge of Albee's work, reported the use of the spine of the scapula as a free graft into the split spinous processes.

Since this early period the spinal fusion operation has been marked by numerous modifications of the original techniques. The common term used now is a "combined fusion" meaning, usually, a Hibbs type of fusion re-enforced with bone, or periosteum and bone removed from portions of the body other than the spine. It must be granted, though, that both Hibbs and Albee realized that in many cases the bone from the spine itself would be insufficient, and that additional bone, when needed, should be taken from the tibia, ilium, or any other accessible depot.

Hibbs lived to see the modification of the spinal fusion take place in his own hospital, where for years additional bone has been used, the articular facets have been denuded of their cartilage, and in the dorsal region the transverse processes of the vertebrae have been chipped up to afford a wider base for fusion.

Howorth has written an excellent article which includes the indications for spinal fusion, the complications, and a detailed recital of the technique of the Hibbs type of fusion. This article is recommended in its entirety to any one interested in this operation. ROBERT T. MCELVENNY, M.D.

Resnick, E.: Epiphyseal Dysplasia Punctata in a Mother and Identical Male Twins. *J. Bone Surg.*, 1943, 25: 461.

A mother and her two identical male twins have been followed up from birth to puberty. The three individuals showed x-ray evidence of epiphyseal stippling. The mother was 42 years of age.

At the age of six she complained of pain and a limp in both hips. Her pain disappeared after puberty. The hands showed foreshortening of the metacarpals, broadening of the terminal distal portions of the metacarpals, and cupping of the interphalangeal joints. There was also a flattening of both femoral heads, a shortening of both femoral necks, upward displacement of the femoral shafts, and an unusually broad pelvis; the humeral heads showed evidence of early chondritis by their abnormal shape. Identical twins were delivered at full term by cesarean section. Each child weighed over 5 lbs. at birth.

Twin No. 1 at the age of thirteen months revealed no abnormalities. At the age of nine years and eight months he was admitted for pain in the left hip. At the age of ten years the roentgenogram of the left hip showed increased widening and irregularity of the left capital femoral epiphyseal line. At the age of ten years and five months the roentgenogram of the left hip showed aseptic necrosis of the left capital epiphysis. At the age of nine years the basal metabolic rate was −31. The blood cholesterol was 137 mgm. per 100 c.c. At the present time the boy is a normal fourteen-year-old male with no symptoms of hip disease. Thyroid extract was prescribed.

Twin No. 2 at the age of six years was admitted with pain in the right hip of one year's duration. Roentgenograms were negative for pathology. From this time on roentgenograms showed a fairly typical course of Perthes' disease. The basal metabolic rate was −30. The blood cholesterol was 137 mgm. per 100 c.c. At the present time the child is a normal male. He has moderate pain on active use of the right hip. Thyroid extract was prescribed.

RICHARD J. BENNETT, JR., M.D.

De Takáts, G., and Miller, D. S.: Post-Traumatic Dystrophy of the Extremities. A Chronic Vasodilator Mechanism. *Arch. Surg.*, 1943, 46: 469.

Thirty-three cases of post-traumatic dystrophy (described by Sudeck in 1900) are presented. This condition was initiated in all instances by an injury to the part. It is clearly demonstrated that the severity of the original injury had no bearing on the onset or the course of the disease. Trauma causing fracture of the long bones with complete transsection of nerves and vessels usually does not seem to be followed by Sudeck's atrophy. In most patients a history of sprains, contusions, frostbites, and burns was given.

A severe, persisting burning sensation in the slightly injured extremity, which is properly immobilized, shows no signs of infection, and apparently is on its way to recovery, is one of the first signs of beginning reflex atrophy. The joint is warm to the touch and edematous, and the muscles show hypertonicity in their effort to splint the painful joint. No osteoporosis is found on the roentgenogram at this stage of the disease. The reflex dystrophy may stop at this point or it may progress to the second stage. At this time the edema has spread and the joint is hard, cyanotic, and cold. The joint becomes stiff rather early and the pain is that of a spreading neuralgia. In most cases the skin and muscles are atrophied, the originally affected and the neighbouring joints are stiff, and marked osteoporosis (ground-glass appearance) is seen in the roentgenogram. Small bones show spotty decalcification and long bones show a similar condition in their metaphysis, the site of greatest vascularity. In a later stage the mottled decalcification becomes diffuse and has the same appearance as osteoporosis due to inactivity, senility, undernutrition, and biliary fistula. On the other hand, osteoporosis due to hyperparathyroidism, hyperthyroidism, adrenocortical syndromes, multiple myeloma, and osteomalacia can hardly be confused with Sudeck's dystrophy. When coarse trabeculations occur with signs of recalcification the peak of the disability has passed. Complete restitution, however, has not been observed.

The signs of Sudeck's atrophy may be so vague and indefinite at the beginning that the diagnosis may be very difficult. In most cases Sudeck's atrophy is accompanied by a number of other conditions complicating the picture. The initial spotty osteoporosis, for instance, is complicated by disuse osseous atrophy. The bone atrophy seen around rheumatic and tuberculous joints is caused by the same vasodilator mechanism found in Sudeck's dystrophy.

Although traumatic and compensation neurosis and malingering have to be differentiated from true reflex dystrophy, it has to be taken into consideration that an anxiety state of the patient has an influence on his autonomic nervous system which is responsible for definite vascular changes. Most patients with post-traumatic dystrophy definitely showed an unstable autonomic nervous system. The importance of this observation can be demonstrated in animal experiments and seen in hemiplegic extremities. In decorticated animals autonomic reflexes are exaggerated, as in the contraction of the stomach after stretching. In hemiplegic extremities (caused by destruction of the pyramidal tract) over-

activity of the sympathetic nervous system can be clearly demonstrated. The author comes to the conclusion that fear, anxiety, and also uncontrollable pain are able to facilitate vascular reflexes which normally subside in a few days.

In 12 cases of this series the blood flow in the affected extremity was determined with a modified pletysmograph. The average increase in the blood flow of the diseased limb as compared with the other limb was 30 per cent. The affected extremity did not respond to vasoconstriction in a cooler bath as readily as the other limb. All of these reactions are expected in chronic vasodilatation. The blood calcium and phosphorus were normal and the blood phosphatase was increased up to 10 Bodanski units.

Several theories are presented which would explain the reflex mechanism of the vasodilatation phenomenon in an extremity affected with post-traumatic dystrophy. The author found the following hypothesis workable although he was unable to prove it. The efferent vasodilator fibers of the posterior root, stimulated directly or reflexly by the injury, secrete a diffusible pain substance which would explain the peculiar type of spreading hyperesthesia. Sympathectomy would not interfere with any nervous pathway but might "wash out" the pain substance. Similar circumstances are observed in herpes zoster which is due to irritation of the posterior root. It can be made painless by paravertebral block.

Conservative treatment may lead to a slow regression of the disease. However, a stiff joint and a shortening of the tendons are usually found, even after pain has disappeared and a partial recalcification has taken place. The recommended treatment in mild cases of Sudeck's atrophy is to immobilize the extremity and to infiltrate repeated doses of procaine hydrochloride into the injured area. In cases in which glovelike or stockinglike hyperalgesia is observed, repeated paravertebral injections may be employed successfully. When pain is abolished by sympathetic block but recurs after a few hours with undiminished intensity, sympathetic ganglionectomy is indicated. In patients in whom Sudeck's atrophy is associated with compensation neurosis, drug addiction, and mental imbalance, none of the preceding treatments has been found successful. Orthopedic correction may be needed after the pain has subsided.

In conclusion, the author states that on the basis of clinical observation, Sudeck's atrophy is a result of chronic reflex stimulation of the somatic and the efferent vasodilator fibers. The reflex may soon disappear or become chronic—characterized by localized or diffuse pain and eventually by osteoporosis. Treatment is most successful in the early weeks and months of post-traumatic atrophy. As the condition progresses more radical intervention is required.

GEORGE I. REISS, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Bellis, C. J., and Churney, O. L.: The Injection of Varicose Veins. *Surgery*, 1943, 13: 411.

The authors note that with the perfection of sclerosing therapy for varicose veins of the lower extremities, surgeons in general have come to avail themselves of this method of varicose-vein therapy. Since probably about 10 per cent of young healthy adults suffer from varicose veins and since most of these people are engaged in activities which necessitate a minimum of medical care during the treatment, any method which would reduce the number of required injections would be an approach to the ideal injection technique. In the usual method of injecting the varix, the patient is in the horizontal or sitting position, several injections being made at different sites at one visit, or single injections are given at successively lower levels at successive visits. The sclerosant, injected into an engorged vein, does not diffuse, as coagulation of the immediately surrounding blood further impedes the spread of the solution. This results in a localized thrombus which can be felt later as a hard, fibrotic lump.

The authors describe a method of injection in this communication that has been proved successful; its effects have been observed in a large series of cases. The method is described in detail. The needle, attached to a syringe containing the sclerosant, is inserted into the vein at the most convenient distal point. The patient then assumes a horizontal position and the affected extremity is elevated by an assistant to a 45 degree angle with the horizontal (Fig. 1 B.) As much as possible of the blood contained in the veins is permitted to drain into the deep system, and when the extremity appears pale, the sclerosant is injected into the ankle vein and the needle is removed. The extremity is then placed on several pillows and the patient is allowed to remain in that position for twenty minutes, following which he is allowed to be ambulatory.

Injection of the sclerosant into the collapsed varix permits a relatively undiluted solution to remain in contact with the intima during the period of elevation of the extremity. The surplus solution flows into the deep venous system where it is diluted and rendered ineffective as a sclerosant. In nearly all of the patients observed by the author, a single injection was sufficient; a few patients have required two injections, the second being into a functionally independent varicose system; no patient has required more than two injections for complete thrombosis.

HERBERT F. THURSTON, M.D.

BLOOD; TRANSFUSION

Helm, J. D., Jr.: The Predictability of the Character (Increased or Normal) of the Erythrocyte Sedimentation Rate. A Survey of 1,000 Cases. *Am. J. M. Sc.*, 1943, 205: 241.

Cutler has stressed the point that the sedimentation rate is a nonspecific phenomenon; it indicates

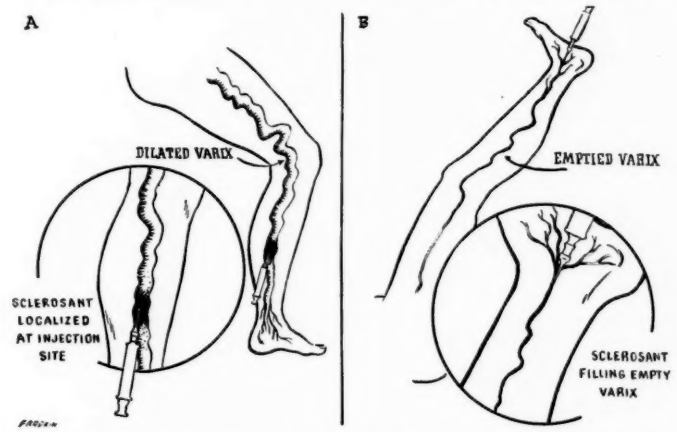

Fig. 1. The effect of position of the extremity on diffusion of the sclerosing solution injected into a varix. A, Extremity dependent, showing localization of sclerosant in varix dilated with blood. The final thrombus develops at the site of injection only. B, Extremity elevated, showing the sclerosant flowing through the capillary lumen of the collapsed varix. The final thrombus develops in the entire vein.

the presence of tissue destruction, and gives an index of the degree of systemic reaction to the disease present. It has two chief values: (1) as a lead to the presence of tissue destruction, and (2) as a gauge of its severity.

There are three techniques of determining the sedimentation rate in use: (1) The Linzenmeier method, in which the time required for the erythrocytes to settle 18 mm. is determined; (2) the Westergren method, in which the millimeters of sedimentation in one hour are determined; and (3) the Cutler method, in which the level of the settling erythrocytes is read at five-minute intervals for one hour and recorded graphically. The accuracy of the tests in indicating the presence of tissue destruction has been reported to be very high. Prerequisites specify that (1) the glassware must be clean, (2) the tube must be absolutely vertical, (3) the test must be done within three hours of the colllection of the blood, (4) the temperature should be between 20° and 25° C., and (5) the tube must be of uniform diameter, greater than 2.5 mm.

In individual diseases, the sedimentation rate has been described as being increased in tuberculosis, rheumatic fever, pelvic inflammatory disease, coronary infarction, active syphilis, gonorrheal and atrophic arthritis, malignancy, hyperthyroidism, and any process in which tissue destruction or chronic infection exists. It has been considerably questionable that an increase is present in chronic sinusitis, dental infection, and tonsillitis. An increase has been found in patients having long-standing diabetes but not in older patients with no disease.

In order to determine the predictability and usefulness of the sedimentation test, the records of 1,000 consecutive patients on whom the rate had been determined were reviewed by Helm. From the survey, it was possible to predict the nature of the sedimentation rate in 943 cases. In 173 cases, the rate was not only predictable but confirmatory in regard to the final diagnosis, and of help in the treatment of the patient. In 770, it was both predictable and confirmatory in regard to the final diagnosis, but of no help in therapy.

It is concluded that serial determinations of the sedimentation rate are of value in following the course of such diseases as rheumatic fever, tuberculosis, coronary occlusion, and arthritis. Single tests are of little or no value except in patients who in the absence of organic lesions are suspected of having only a functional disease. In these patients, an increased sedimentation rate suggests the presence of a morbid process and makes further investigation mandatory. STEPHEN A. ZIEMAN, M.D.

Page, R. C., and De Beer, E. J.: The Effect of Storage at Various Temperatures on the Prothrombin Clotting Time of Human Plasma. *Am. J. M. Sc.*, 1943, 205: 257.

Having noted that the prothrombin time changes when human plasma is allowed to stand at room temperature, Page and DeBeer made a study of the effect of different temperatures and different time intervals on the prothrombin clotting time of human plasma. The technique employed for testing prothrombin clotting is described. The results are presented in the accompanying table. Thus, for each temperature level the prothrombin clotting time varied directly with the duration of storage. The rate of increase was greatest when the plasma was stored at 38° C. and least when the plasma was kept in the refrigerator.

Fig. 1. Graph showing increases in prothrombin clotting time as affected by temperature and duration of storage of plasma.

The results of this study reveal the necessity of completing the prothrombin clotting test as soon as possible after the blood is obtained.

EDWIN J. PULASKI, M.D.

RETICULOENDOTHELIAL SYSTEM

Roettig, L. C., Nusbaum, W. D., and Curtis, G. M.: Traumatic Rupture of the Spleen. *Am. J. Surg.*, 1943, 59: 292.

Traumatic rupture of the normal human spleen is not as rare as is commonly thought. Its incidence, both real and apparent, is increasing in civilian life and is high in war injuries. The spleen is the most frequently injured of all the abdominal viscera. The types of injury most frequently causing this lesion, aside from war injuries, are automobile accidents and falls. Five types of pathological rup-

ture are recognized, each leading to a definite clinical picture. Of these the syndrome of delayed hemorrhage is the most frequently overlooked.

Associated severe lesions occur in about 50 per cent of the cases. These materially increase the likelihood of a fatal outcome and may call for rapid surgical intervention.

There are no pathognomonic signs or symptoms of splenic rupture. Abdominal rigidity and tenderness in general or somewhat localized to the left upper quadrant are encountered in the majority of cases. Shock is also most frequently noted. These clinical findings together with certain simple laboratory tests enable the surgeon to make the diagnosis with certainty. The laboratory tests of greatest value are: repeated determinations of the hemoglobin and erythrocyte count, the Scudder falling-drop test for hemoconcentration, and a flat abdominal roentgenogram with an elevated left diaphragm.

The treatment of traumatic rupture of the spleen is always surgical. Splenectomy is the operation of choice. Operation should not be delayed in an effort to combat shock. This should be treated while the operation is in progress. Autotransfusions are recommended.

Ultimate ill effects subsequent to absence of the spleen after splenectomy for splenic rupture are negligible. The authors have been able thus far to determine no ill effects. Splenosis or the occurrence of splenic autotransplants within the peritoneum is a rare late complication. J. M. MORA, M.D.

Bueermann, W. H.: The Latent Period and Delayed Hemorrhage Following Traumatic Rupture of the Spleen. *U. S. Nav. M. Bull.*, 1943, 41: 73.

Two cases of delayed hemorrhage following traumatic rupture of the spleen and 1 case of nontraumatic hemorrhage are reported.

The first patient was operated upon thirty-eight days after his ship was torpedoed. The history and laboratory findings were suggestive of a perforated peptic ulcer. Operation revealed a ruptured spleen. The spleen showed infarction of the convex surface with parenchymal and subcapsular hemorrhage on dissection. There were also necrosis and rupture of the splenic capsule.

In case No. 2, the seaman was operated upon four days following abdominal injury. Traumatic rupture of the spleen was suspected and the operation confirmed the diagnosis. The spleen was removed. Pathological examination of the spleen showed a recent fracture of the spleen.

The third patient gave the history, signs, and symptoms of old malaria. Because of the strictly medical aspects of the case, surgical consultation was not obtained. Pathological diagnosis was nontraumatic rupture of the spleen with severe intraperitoneal hemorrhage and exsanguination.

Many other spontaneous ruptures of the spleen reported by other authors are discussed.

RICHARD J. BENNETT, JR., M.D.

Eliason, E. L., and Stevens, L. W.: Surgery of the Spleen in Blood Dyscrasias. *Surgery*, 1943, 13: 177.

The scope of this presentation is limited to the blood dyscrasias that are favorably affected by surgical procedures directed on the spleen, i.e., splenectomy, or upon its blood supply by ligation of its vessels. Justification of these procedures must be evaluated by the mortality and the morbidity following such treatments.

Splenic surgery has been employed sporadically since before Christ and later on, occasionally and specifically for the purpuras, splenic anemias, and the icteroanemias, with fairly good results. The injudicious use of splenic surgery for pernicious anemia, leucemia, aplastic anemia, toxic infections, allergies, and drug anemias produced either a high mortality or left the surviving patient usually worse for the experience. In the last twenty or twenty-five years, with a more rational selection of cases and improved preoperative and postoperative care, splenectomy has earned a foremost place in the treatment of splenic anemia, idiopathic or essential thrombocytopenic purpura, and hemolytic icteroanemia.

The authors herewith present the facts and evaluate surgery on patients suffering from one or the other of these three conditions. They present an extensive review of the literature of the last ten years. A statistical report is compiled to show the mortality and life expectancy following splenectomy in cases of splenic anemia, thrombocytopenic purpura, and icteroanemia. In addition they report on 63 cases of their own. The technique of splenectomy is discussed.

The authors note that splenectomy gives the patient with splenic anemia the best chance. The earlier in the disease that splenectomy is done, the lower the surgical mortality and the greater the life expectancy. Splenectomy seems to be the only choice for the treatment of cirrhosis. The operative mortality should not be over 10 per cent at the worst, and some of the patients have lived twenty years.

Cases of chronic hemorrhagic purpura that do not respond to conservative therapy should be subjected to splenectomy. If the bleeding in acute or fulminating purpura hemorrhagica does not respond promptly to conservative measures, splenectomy should be performed early, before the patient's condition is critical. A careful elimination of infection is important in the prevention of recurrent purpura. Recurrence of a serious nature is found to be unusual.

Splenectomy is the treatment of choice in hemolytic jaundice, particularly in children. It is preferable that the operation be performed during a remission, but occasionally it is necessary to remove the spleen during an acute exacerbation. The results following splenectomy are good in a high percentage of cases. In adults splenectomy is not always necessarily indicated. HERBERT F. THURSTON, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Herrell, W. E., and Heilman, D.: Tissue Culture Studies on Cytotoxicity of Bactericidal Agents. Effects of Gramacidin, Tyrocidine, and Penicillin on Cultures of the Mammalian Lymph Node. *Am. J. M. Sc.*, 1943, 205: 157.

Herrell and Heilman tested the effect of gramacidin, tyrocidine, and penicillin on the migration of lymphocytes and other cells in cultures of the mesenteric lymph node of the rabbit. The technique consisted of lying-drop slide cultures in 4 series:

1. One drop of homologous rabbit plasma plus 3 drops of homologous rabbit serum (1:5), chick embryo extract, plus a lymph node explant (control)
2. Same as 1 plus gramacidin in various dilutions
3. Same as 1 plus tyrocidine in various dilutions
4. Same as 1 plus penicillin in various dilutions

The cultures were incubated for twenty-four hours and the radius of the migration zone from the fragment to the outer limit of migrating cells was measured. After measurement had been made, the cultures were fixed, sectioned, and stained. Full details of the technique are given in the original article. The results follow:

1. Small doses of gramacidin (5 μg. and 20 μg. per cc.) did not affect significantly the migration or morphology of the cells as compared with the controls. In the 20 μg./cc. dilution, however, hemolysis was evident. In higher concentrations (80 μg./cc.) hemolysis was complete, migration of cells was inhibited, and the lymphocytic elements showed degenerative changes.

2. Tyrocidine, on the other hand, did not hemolyze erythrocytes nor affect the migrating lymphocytes and granulocytes.

3. With penicillin 1 mgm. per cent concentration was necessary before any toxic changes could be observed; no change was observed in the erythrocytes present.

From this study it was seen that gramacidin is more toxic than tyrocidine for cells migrating from explants; also, it hemolyzes erythrocytes. However, the amount of gramacidin necessary to produce a toxic effect is large compared with the amount necessary to kill most gram-positive cocci growing in a tissue culture medium. Penicillin is approximately one-tenth as toxic by weight as gramacidin and it does not cause hemolysis.

EDWIN J. PULASKI, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Ungley, C. C., and Horton, J. S. F.: Sore and Bleeding Gums in Naval Personnel. *Lancet*, Lond., 1943, 244: 397.

In 51 naval patients with sore and bleeding gums, often labelled scorbutic, the average daily intake of ascorbic acid estimated from dietaries ranged from 16 to 80 mgm. (average 37 mgm.) The patients were "unsaturated," but no more so than healthy controls. Clinical evidence of scurvy or "subscurvy" was absent. Local causes—infections and calculus—were sufficient to account for the gum condition, and the ascorbic acid was therapeutically ineffective. In this series vitamin-C deficiency was not the prime cause of sore and bleeding gums. About 85 per cent of the patients had Vincent's stomatitis. No relation to nicotinic-acid deficiency was demonstrable.

Loria, F. L.: Chemotherapy in Penetrating Abdominal Gunshot Wounds. *Surgery*, 1943, 13: 588.

The subject of chemotherapy of general peritonitis with emphasis on the possible influence of the sulfonamides is briefly reviewed.

Although the mortality rate of penetrating abdominal gunshot wounds is still very high, a tendency toward improvement seems evident. At least 90 per cent of the patients with penetrating abdominal gunshot injuries die of hemorrhage and shock, or of generalized peritonitis. In large series of cases the former causes usually predominate, but general peritonitis is almost always a very close second.

The author presents a study based on a group of 100 cases of penetrating gunshot wounds of the abdomen admitted to the New Orleans Charity Hospital from July 9, 1938, to July 9, 1942. Forty-nine received some form of chemotherapy, whereas 51 received no sulfonamides. In the former group the mortality rate was 18.4 per cent, and in the latter 50.9 per cent. Of 11 patients who were given intraperitoneal implantations of sulfathiazole, none died.

In this series sulfathiazole was the only sulfonamide used intraperitoneally. Blood-level determinations, made in only a few instances in this group, failed to show any high figures. None of the patients treated with sulfonamides showed any evidence of toxicity attributable to these drugs. The sulfonamides seem especially beneficial in cases with "massive hemorrhage." Such cases showed a 91.6 per cent mortality in the group receiving no chemotherapy as compared with a 40 per cent fatality in the group treated with sulfonamides. The author believes that the use of the sulfonamides, especially the intraperitoneal use, in gunshot wounds of the intestines, will very materially lower the mortality in these victims. WALTER H. NADLER, M.D.

Auster, L. S., and Willard, J. H.: Hydraulic Abdominal Concussion. *J. Am. M. Ass.*, 1943 121: 995.

Hydraulic abdominal concussion denotes a syndrome of intra-abdominal intestinal injury resulting from underwater explosions with compression of the abdominal parietes on resistance to the waters in motion simultaneously with the entrance of sea water into the bowel through the unprotected anus. The accident occurs usually in a man who finds himself in the sea after abandoning ship following a naval engagement; he is within a radius of 100 to 300 yards when one or more depth charges explode under water; forceful water currents are generated producing external abdominal compression simultaneously with the entrance of sea water into the bowel through the anus. Either immediately following the blast or within a half hour several expulsive bowel movements take place, with the passage of fluid stools accompanied by violent cramps in the attempt of the bowel to rid itself of the bulk of strongly irritating hypertonic salt water. Nausea and vomiting with signs of intraperitoneal irritation or injury frequently occur. Dehydration and profound shock resulting from exposure and immersion are common. Bowel irritability with more or less repetition of the fluid stools continues for several days, and sometimes for two weeks.

Examination of the abdominal contents at operation performed in cases characterized by severe peritoneal irritation have shown the chief lesion to be miliary discrete and confluent, subserosal and mucosal, intestinal hemorrhages with the frequent appearance of larger areas of ecchymosis and hematoma which must inevitably involve the mucosa to a greater or lesser degree. The serosal irritation produces the peritoneal signs; the breakdown and tension about larger areas of intramural hemorrhage and the damage to mucosa have produced evidence of minor and major intestinal bleeding. The authors believe that the late results of these injuries may vary from nothing at all to the full blown picture of active or healed ulcerative colitis. They suggest that these possibilities be kept in mind for future reference in cases with a history of hydraulic abdominal concussion.

The relatively rare examples of macroscopic perforation seen provoked some speculation. In those patients whose intestines were seen at operation it was unusual to see involvement of the small intestine of any other type than scant miliary subserosal hemorrhage. The lesions were always chiefly in the colon. No cases of small-bowel perforation were seen, the ileocecal valve apparently acting as an efficient barrier to pressure from below. Rents in the large bowel were either pinpoint or longitudinal. They were all at a distance from the rectum, and the authors believe that their occurrence de-

pends on a combination of factors including the degree of pressure both within and without the bowel lumen, and the amounts of fecal material and of gas present at the time. It is their impression that most of these perforations are the result of "blow outs" at a point where a bubble of gas compressed from below meets an obstruction. Only this would explain the occurrence of leaks in the cecal area and transverse colon. The longitudinal nature of the rents is consistent with the anatomical weakness in structure found in the colon in this direction.

The variability of the forces operating in underwater explosions has given rise to effects other than direct intestinal concussion. Sudden compression of the abdominal wall against resistance has produced injury simulating traumatic hernia.

There have been few instances of intrathoracic compression injury seen in association with hydraulic abdominal concussion. It is undoubted that there have been instances of intrathoracic damage either by direct violence or by aspiration of seawater incidental to the marine disturbance. Many men have been lost at sea following these incidents. Survivors have been protected by the natural resistance and resilience of the thoracic cage, reinforced and protected by the thick kapok life jacket which has been worn by all those who have been rescued. This type of compression involves a different mechanism than blast injury in the air and should not be confused with it.

Treatment of these injuries requires good judgment and, at times, considerable courage to withhold operation in the face of what may seem to be an urgent abdominal emergency. The injuries are, in fact, all urgent abdominal emergencies, but experience has shown that supportive treatment without operation produces the best results. Manifestations of frank major perforation, of course, are indications for operation. Despite all of our modern techniques and even with the invaluable support of chemotherapy, the mortality in such cases is unusually high and apparently unavoidable. Treatment of small perforations and the peritoneal inflammatory reactions secondary to intramural intestinal hemorrhage and concussion has been most successful with morphine, indwelling intestinal suction drainage, and intravenous infusions of electrolyte, dextrose, and plasma.

Fifteen case histories are presented to illustrate features of this syndrome.

EDWIN J. PULASKI, M.D.

Brunschwig, A., Clark, D. E., and Corbin, N.: The Intravenous Injection of Casein Digests (Amino Acids) in the Maintenance of Nutrition. A Consideration of Medicomilitary Aspects. *Mil. Surgeon*, 1943, 92: 413.

A discussion, based upon clinical experience, is presented to suggest that parenteral nitrogenous nutrition, in the form of intravenous injections of casein digest representing all essential amino acids, may be of value in military practice in the management of the severely wounded when nutritional support has become an important factor. Such a method of nutrition also appears indicated in nonsurgical patients presenting marked debility and varying degrees of starvation, as in intractable diarrheas and in the malnutrition associated with severe febrile states.

J. M. MORA, M.D.

Friedell, M. T., and Burke, R.: Preliminary Appended Report on the Causation of Blast Injury. *U. S. Nav. M. Bull.*, 1943, 41: 363.

A comparison of injury from immersion blast with injury following air blast necessitates considering the explosive system and the medium transmitting the force, as well as the position of the body. The *brisant* character of the explosive must also be studied. In a highly *brisant* explosive, the velocity of detonation is so rapid that it produces its maximum pressure instantaneously, the pressure falling rapidly. An explosive with less *brisance* has a less steep gradient in pressure rise, as calibrated in time, and continues to exert considerable pressure for a long time. The range of effects of *brisance* is supposed to be confined to the immediate neighborhood of the explosion, and it, therefore, exerts its greatest effect upon the medium with which it is in direct contact.

There are two types of effects following explosions under water. The first is the percussive effect of the explosive. This is the result of the *brisance* of the explosion, and, if instantaneous, the percussive effect is for all practical purposes the only acting force present. Hemorrhagic lesions are believed to be the result of this percussive force. With a less *brisant* explosive, pressure continues to be exerted. This secondary force is much greater than the primary percussive blow. The impact of this massive concussive force on the abdomen is believed to be the cause of the perforations.

SAMUEL KAHN, M.D.

Greaves, F. C., Draeger, R. H., Brines, O. A., Shaver, J. S., and Corey, E. L.: An Experimental Study of Underwater Concussion. *U. S. Nav. M. Bull.*, 1943, 41: 339.

In the authors' experiments on underwater concussion, pulmonary damage was shown to be the cause of death occurring immediately after underwater blast. The respiratory function of the lungs was immediately and totally destroyed. The animals used in these experiments were not rendered unconscious by the blast, but they struggled in the water and continued their swimming motions for several seconds. Cyanosis appeared, and the nose and mouth exuded a bloody, frothy foam. Death occurred in about one minute. When sublethal charges were used the animals continued to swim, but upon being removed from the water they remained quiet and appeared ill. Some of these animals died after a few hours. Those that survived acted normally within a short period of time and showed no ill effects thereafter. Animals receiving minimal injuries remained quiet for a period of from

ten to fifteen minutes after the blast, following which they appeared normal and showed no further ill effects.

The uniformity of lesions produced under comparable conditions in all animals was remarkable. In the lethal cases the lesions in the lungs were characterized by diffuse hemorrhage throughout the entire parenchyma. Very little aerated pulmonary tissue remained. Free and clotted blood was found in the air passages; occasionally, lacerations of the visceral pleura, with secondary hemothorax, were seen. Subpleural hematomas occurred. The darker hemorrhagic areas, representing the greater damage, corresponded to the interspaces rather than to the ribs.

In the gastrointestinal tract 2 types of lesion were seen in lethal cases: (1) complete perforation of the wall, and (2) hemorrhagic discoloration of the wall. Both types were seen in all portions of the tract, and both were definitely related to the presence of gas within the lumen. Not all animals receiving fatal blast injuries showed intestinal lesions. The presence of gas appears to be the determining factor in their production. These lesions were never found in animals in which the gastrointestinal tract was collapsed and empty.

Sublethal charges produced similar but less extensive damage.

It is because the presence of air or gas is the determining factor in the production of injuries by blast that pulmonary tissue is extremely susceptible to injury. The only other structures that contain air or gas are the gastrointestinal tract and the accessory nasal sinuses, and these also showed susceptibility to injury in the animals studied. Injuries occur in the skull and in the upper respiratory passages when the head is submerged at the time of the explosion. Pathological changes were not observed in solid organs nor in tissues that did not contain air or gas.

Kapok and foam rubber were found to be effective in preventing or minimizing the injurious effects of the compression wave. SAMUEL KAHN, M.D.

Friedell, M. T., and Ecklund, A. M.: Experimental Immersion Blast Injury. Preliminary Report. *U. S. Nav. M. Bull.*, 1943, 41: 353.

The clinical aspects of immersion blast vary from those of air blast, in that abdominal lesions and peritonitis occur in the former. Abdominal symptoms have been reported in air-blast cases, but only hemorrhagic areas were found on the subserous aspects of the intestine. No perforations have been recorded in air-blast cases, but they do occur in immersion-blast injuries.

Hemorrhagic areas appear in the muscularis of the intestinal tract following immersion blast. Pulmonary damage occurs, and, if severe enough, leads to almost immediate lethal outcome. If not severe, the animal almost invariably recovers.

Perforations of the intestinal tract occur over areas which contain fecal material in scybalous form, and probably over air bubbles, with resultant peritonitis. These experimentally produced perforations explain those clinically observed in the colon and terminal ileum and in the first portion of the jejunum. Perforations occur only in immersion-blast injury, the force of the explosion in these cases being greater than that which produces hemorrhagic lesions. The perforations are an immediate result of the blast, and do not occur later because of necrosis of the bowel wall. These perforations, therefore, demand early surgical intervention. Hemorrhagic lesions do not require surgical treatment.

Protection of the chest was apparently afforded men exposed to immersion-blast injury by the heavy rigid life jacket; a rigid covering was used experimentally to protect the thorax of animals exposed to immersion blast. It is reasonable to assume that extension of the life jacket to cover the abdomen would be beneficial. Swimming on the back affords some protection both to the chest and to the abdomen.

Theories as to the causation of immersion-blast and air-blast injuries are still controversial. In the experiments, there was no evidence that water was forced through the anus, causing rupture of the bowel. The lesions seem to be a direct effect of the explosive force itself, transmitted through the elastic walls of the abdomen and thorax.

SAMUEL KAHN, M.D.

White, J. C.: Vascular and Neurological Lesions in Survivors of Shipwreck. Immersion-Foot Syndrome Following Exposure to Cold. Painful Swollen Feet Secondary to Prolonged Dehydration and Malnutrition. *N. England J. M.*, 1943, 228: 211, 241.

Immersion foot, secondary to exposure to cold, appears to be caused by sublethal injury to the chilled tissue cells, the cutaneous arteriolar and capillary bed, and the nerve fibers. The process differs only in the degree of chilling and wetting from frostbite, trench foot, and shelter foot. The ischemia during prolonged exposure to intense cold is followed by a period of acute inflammation. The hyperemic reaction of the feet is due mainly to the chemical effects of the products of tissue injury. Paralysis of the vasoconstrictor fibers is an added factor, but is of secondary importance. In spite of the increased flow of blood in the main vessels, there is a disparity between the blood-oxygen supply and demand in the cutaneous capillary bed. Capillary permeability is thereby increased. Edema, pain, and petechial hemorrhages, as well as the congestion seen when the feet are in the dependent position, are evidence of injury to the blood vessels. By cooling and reducing the local metabolism and the need for oxygen, both edema and pain are diminished. The inflammatory reaction and hyperemia fade in a few weeks, and the circulation usually returns to normal at this time.

Neuritic pain makes its appearance with partial recovery of the nerves and continues until nerve

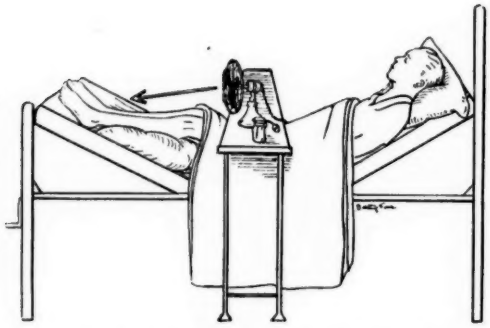

Fig. 1. Method of cooling feet by exposure to room air supplemented by electric fan. Note that the legs are elevated and that the heels are protected from pressure by a pillow under the calves. The injection of a fine spray of water into the revolving fan blades with an atomizer further increases the cooling.

function is restored. In mild cases it may disappear in two weeks, but it may last as much as six months. Much can be accomplished by suitable treatment. This must be directed primarily at reducing local tissue metabolism in the early period, and in preventing further injury and infection of the insensitive swollen foot. Gangrene should be a rare complication.

TREATMENT

Prophylaxis. All ship's officers and seamen should be acquainted with the dangers of exposure to cold air and water. The most loose fitting waterproof boots should be worn, and extra pairs of heavy socks carried along. When the boots ship water, putting on a pair of dry socks helps very much. Greasing of the feet is also very helpful. Movement of the limbs, even temporary elevation, is recommended.

First Aid. When shipwrecked survivors are picked up after prolonged exposure to wet and cold they should be lifted aboard the rescuing vessels and carried below if their feet are numb in order to prevent further injury of the anesthetic skin. These patients require treatment for general as well as local chilling. Care, however, should be exercised not to warm the lower limbs too rapidly as this is very injurious. The immediate local treatment consists of keeping the exposed extremity cool, elevated slightly above the level of the heart, and surgically clean. The feet are cleansed with soap and cool water to remove dirt and bacteria and to prevent infection. When blisters have ruptured the raw areas should be dusted with sulfanilamide powder or sulfathiazole ointment should be applied. If neither is available they should be let alone. The feet should be kept cool by exposure to the room air, no bedclothes to be below the knees. The room temperature should be below 70°F., and if possible direct cool air from a fan (Fig. 1) should be blown over the exposed feet and legs. No pressure points are to be allowed on the feet, and especially the heels, the legs being elevated on a pillow. Under no circumstances should the patient be allowed to sit with the legs dependent. Any rubbing or massage is to be avoided. Codeine or morphine is to be used to control pain.

Hospital. On arrival at the hospital, the severe cases have pronounced swelling, blebs, and discoloration. They have the greatest amount of anesthesia, and for the first few days, the least pain. Hyperemia is striking, with dilatation of the main arteries and prominent veins, but circulation through the cutaneous arterioles and capillaries is nevertheless inadequate, as shown by a dusky cyanotic color and minute hemorrhages in the skin. The rationale of treatment is to reduce tissue metabolism to a point where there is an adequate supply of oxygen to all the cells. This can be accomplished by cooling the skin from 5 to 10°F.—to a point below 85 degrees. Under these conditions the color improves, blebs tend to resorb, and edema is reduced. In mild cases cooling is accomplished by exposure to room air. Slightly greater chilling can be obtained by having an electric fan on a bedtable blow air over the feet (Fig. 1), and this can be rendered more effective still if the patient occasionally sprays water from an atomizer into the stream of air from the fan. In the most severe cases of hot, congested feet, and also when the neuritic pains are severest, neither of these measures is effective. Severe cooling in these cases is accomplished by covering the foot with cotton hand towels, and applying ice bags to the dorsum, sole, and sides of each foot. These are encased in oil-silk wrappings to 12 cm. above the malleoli, and a thick insulating pad of fluffed cotton or cellulose, and a rubber pillowcase are tied loosely about the calf of each leg. The purpose of this pack is to reduce the temperature of the skin to between 80 and 85°F. The packs should be changed at four-hour intervals and observations of the temperature made at these times. When the patients have recovered, they should, before getting out of bed, do Buerger's exercises three to four times a day for half-hour periods for about a week.

The true immersion-foot syndrome described is caused by direct thermal injury to the tissues short of actual freezing. It develops after relatively brief periods (one to four days) of contact with water at temperatures below 50°F. A superficially similar, but fundamentally quite different, condition develops after exposure to warm water and bright sunshine in survivors of torpedoed vessels who have been adrift in the Gulf Stream without an adequate supply of water or food for periods of over two weeks. These men suffer mainly from lack of Vitamin B complex and also possibly Vitamin K. Besides the local edema of the feet, they suffer from stomatitis, ulceration of the gastrointestinal tract, numbness and tingling in the hands and feet, and dehydration. This condition is not serious, it rarely requires more than a fortnight's treatment and responds in a

specific manner to a high protein diet and Vitamin B complex therapy.

It has been noticed that dry, concentrated foods are worse than none at all when water is scarce. A more satisfactory ration should be worked out. A concentrated B complex vitamin preparation should be included. DAVID J. IMPASTATO, M.D.

White, J. C.: Painful Edema of the Extremities in Shipwrecked Mariners. A Newly Recognized Syndrome Occurring after Prolonged Dehydration, Malnutrition, and Vitamin Deficiency in Southern Waters. *U. S. Nav. M. Bull.*, 1943, 41: 32.

"Immersion foot" is a distinct clinical syndrome closely resembling "trench foot." The etiological factors producing this condition are crowded conditions in lifeboats with immersion of the feet in cold water short of actual freezing, and dependency and immobility of the feet. The legs become discolored, swollen, and numb from the ankles down. After removal from the cold an intense inflammatory reaction develops as with any thermal injury; this is accompanied by reactive hyperemia of the deep tissues, blisters, petechial hemorrhages, and impaired capillary circulation of the skin. The injury to the peripheral nerves is characterized by sensory changes and neuritic pain during the period of recovery. Survivors of torpedoed vessels in the North Atlantic were well except for the local thermal injury.

The author reports an entirely different syndrome occurring in shipwrecked survivors exposed to the elements in relatively warm southern waters. The only similarity of the two groups was painful edema of the feet due to long dependency and immobility.

Those mariners who were adrift in the southern latitudes for about two and a half weeks experienced intense sunshine and heat, hard work at bailing and sailing, thirst and progressive dehydration so severe that they could not even swallow the concentrated food rations. After a week they began to notice peculiar tingling and aching sensations in the soles of the feet and to a lesser degree in the hands. On finally being rescued they found walking without support difficult or impossible because of loss of balance due to numbness of the feet and loss of the sense of position. In addition, all were suffering from exhaustion, malnutrition, and dehydration. Many of the men had glossitis, stomatitis, diarrhea, and blood in the stools.

In order to treat intelligently shipwrecked survivors who have been exposed to starvation, thirst, and intense heat, it is important to know the serum-chloride values, changes in water balance, blood count, hematocrit serum protein, nonprotein nitrogen, and prothrombin time when occult blood is found in the stools.

Hypoproteinemia from starvation was an additional cause of edema in the feet of these men, besides dependency and immobility.

Vitamin deficiencies in these survivors require further study. It is postulated, but not proved, that the stomatitis, sensory disturbances in the hands and feet, and plantar tenderness which developed in these patients were caused by a deficiency of the antineuritic factor and other components of the Vitamin B complex. An added deficiency in vitamin K was found in 3 cases in which the prothrombin time was determined. Loss of blood in the stools was a common occurrence.

The author concludes that this newly recognized syndrome should not be classified as "immersion foot." The possibility that deficiency of vitamins B and K may develop in such a brief period as two and one-half weeks has not heretofore been suggested. JOHN E. KIRKPATRICK, M.D.

Callender, G. R.: Wound Ballistics. Mechanism of the Production of Wounds by Small Arms. Bullets, and Shell Fragments. *War Med.*, Chic., 1943, 3: 337.

The application of the laws of physics to the production of wounds is described, and the relative importance of the factors concerned is discussed. These factors are the shape, weight, and velocity of the missile; the density or character of the tissues involved; the direction of the transmitted energy; and the rate at which it is transmitted.

The rate of energy transmission, that is, the power used in producing a wound, is the measure of the severity of the wound; the rate varies as the cube of the velocity of the missile. J. M. MORA, M.D.

Ferguson, L. K., Brown, R. B., Nicholson, J. T., and Stedman, H. E.: Observations on the Treatment of Battle Wounds Aboard a Hospital Ship. *U. S. Nav. M. Bull.*, 1943, 41: 299.

Observations on the treatment of 4,039 battle casualties received aboard a naval hospital ship are narrated. The patients had surgical conditions predominantly and had been transferred from various ships and forward battle areas. The transferal time varied from twelve hours to two weeks, the majority of patients being received from five to fourteen days after their injury. All had had previous treatment and were in excellent condition.

There were 7 deaths, 6 of which could be considered due to the battle casualties. Practically every form of battle injury was represented. The most common injuries appeared to be multiple shell-fragment wounds and compound fractures. There were also burns, immersion-blast wounds, and shark bites. The injuries varied from punctures to defects measuring 8 by 12 in.

Sulfonamides had been sprinkled into practically all the wounds. Deductions drawn from the management of these injuries were listed as follows:

1. The local use of sulfonamides made radical wound débridement unnecessary, and even destructive, in most cases.
2. Conservatively treated wounds with secondary suture fared better than those with débridement.
3. Wounds sutured over caked sulfonamides invariably gave complications.

4. Through-and-through bullet and shell-fragment wounds gave little or no difficulty, unless important structures were damaged. Cleansing, spraying with sulfathiazole, and the application of a pressure bandage constituted the complete therapy.

5. Face wounds were similarly treated and sutured with fine alloy steel. These healed without complications.

6. Chest wounds of all descriptions were handled conservatively, aspirated only in the presence of embarrassed respiration, and transfusion was given when it was indicated. This therapy made complications rare.

7. Abdominal wounds accounted for 3 of the 6 deaths; such wounds, fortunately, are not numerous. Immediate surgical exploration is indicated in these cases, with suture of the perforations, to obtain better prognosis. Because of the prevalence of infection, closure of the skin and subcutaneous tissues in these cases is contraindicated.

8. Joint wounds do not progress as well as soft-tissue wounds. Pain is prominent even with immobilization. Instillation into the joint of sulfathiazole suspension, and adequate cast application constitute good treatment.

9. Conservative treatment deserves a fair trial in cases of suspected gas gangrene, with emphasis upon the local and systemic use of sulfathiazole, and immobilization of the wounded part.

10. Foreign bodies are not removed unless they produce infection, lie in joints, are the source of pain, or cause symptoms by pressing upon or affecting vital structures.

11. Secondary hemorrhage is a constant threat in the handling of battle casualties, and makes adequate emergency treatment a necessity. Pulsating hematomas can be safely treated only by ligation of the involved artery and its accompanying vein.

12. The systemic effect of hemorrhage is slight if transfusion can be employed and the blood loss replaced immediately. STEPHEN A. ZIEMAN, M.D.

Crile, G., Jr.: Experiences of the Surgical Service of the U. S. Naval Hospital, Auckland, New Zealand, with Casualties from the Initial Solomon Islands Engagement. *U. S. Nav. M. Bull.*, 1943, 41: 306.

The casualties received at this mobile hospital consisted principally of gunshot wounds received during landing operations and on beaches, wounds received aboard ship as a result of shell-fire, and, lastly, burns.

First-aid treatment had been rendered in most cases; it consisted of dressing and the application of sulfanilamide into the wound. Definitive treatment, including surgery (usually deferred from eight to twelve hours), was done aboard transports or, later, on the hospital ship. Burn patients had been treated by the application of tannic-acid jelly before being transferred. Compound fractures and some soft-tissue wounds, for the most part, were immobilized in plaster. The majority of the patients were reasonably comfortable under this management and in good condition. The treatment of infected wounds constitued the chief problem, although these cases were not prevalent nor severe. Approximately 15 per cent of all wounds and burns were grossly infected with cellulitis and systemic reaction.

Observations on the management of these casualties led to the following conclusions:

1. Infection when present is more severe in a wound closed by primary suture than in a wound left open.

2. Wounds which receive conservative treatment with only the introduction of sulfanilamide fare as well as those subjected to surgical intervention.

3. The presence of metallic foreign bodies does not appear to have a deleterious effect on wound healing. The incidence of cellulitis and severe infection does not appear to be materially increased by the presence of even large metallic foreign bodies.

4. Immobilization in plaster has a beneficial effect on most wounds thus treated.

5. Patients with infection who are subjected to frequent dressings involving movement of the affected part do not do as well as those in which the dirty dressings are left in place in plaster; if adequate drainage is provided, immobilization gives better results than hot soaks, irrigation, or the application of sulfonamides, or any form of treatment involving frequent change of dressings.

6. Secondary closure provides for quicker healing and gives better results than do skin grafts. Whenever possible this should be used instead of grafts.

7. The use of sulfonamides locally and orally results in most dramatic prevention of infection, but has little value in cases in which the infection is already well established.

8. Chlorine antiseptics and azochloramide, when introduced into abscess cavities along with sulfonamides, promote better healing than do the sulfonamides alone.

9. Pain on removal of the dressing is well controlled with pentothal, and dressings covered with perforated cellophane to prevent sticking of the dressing to the wound aid rapid healing.

10. Foreign bodies without symptoms are to be left *in situ*.

11. Compound fractures are to be immobilized in plaster. When overriding is present, traction produces good results even after three weeks have elapsed from the time of injury.

All but 1 case of 46 burns were treated with tannic-acid spray or jelly. Hands and faces were treated similarly. There were only 15 per cent which presented evidence of sepsis, or pus, beneath the eschar. Twenty-nine per cent of all second-degree burns and all third-degree burns were grossly infected. The latter had skin grafts applied as soon as possible. The only death occurred in a patient with extensive second- and third-degree burns of 70 per cent of his body surface.

Thirty patients were admitted with injuries of the peripheral nerves, the most common site being in the

leg or in the thigh. Eighteen suffered eye injuries, and 11 required amputations. There were 5 patients with injuries of the vascular system which produced pulsating hematomas. These were treated with simple ligation but without suture and excision of the injury.

Pentothal anesthesia proved a most valuable anesthetic agent, and the most striking feature of these cases was the rapid recovery which took place in all of the injured persons.

STEPHEN A. ZIEMAN, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Berman, J. K., Houser, A. D., and Kurtz, W. A.: Preoperative Scrubbing in Abdominal Surgery. Experimental Studies. *Ann. Surg.*, 1943, 117: 535.

The authors attempted to determine the value of Kocher's suggestion that vigorous cleansing of the skin of the surgical patient is of great value in preoperative preparation. Their experiments were made on guinea pigs and dogs and scrubbing was done with a small soft hand brush, soap, and unsterilized warm water applied to the part vigorously for about eight minutes. The term "preoperatively" is used to include a period up to twelve hours before operation; immediate surgical sterilization is not included in this study.

To determine the normal reactions of guinea pigs, an incision 5 cm. long was made in the abdominal wall and extended through the skin, subcutaneous tissue, and abdominal muscles. The peritoneum was not opened. The incisions were closed with interrupted silk sutures in the muscle layers, subcutaneous tissue, and skin. Three of 11 wounds which healed by primary intention developed microscopic evidence of infection, although there were no clinical signs to indicate its presence. Having determined the normal reaction, another series of animals was studied in which 0.3 cc. of a six-hour culture of staphylococcus aureus was inoculated into the incised abdominal muscles; 67.5 per cent of these animals developed infections in their wounds.

Similar experiments were made on animals who were scrubbed for from five to eight minutes, from twenty-four to one hundred and forty-four hours before the incision and inoculation.

It was found that surgical scrubbing of the abdominal wall twenty-four, forty-eight, and seventy-two hours before operation does not protect animals against wound infection, and may predispose to decreased resistance. Scrubbing from ninety-six to one hundred and twenty hours before surgery seems to increase the resistance slightly in guinea pigs, probably because of the stimulation of the blood supply.

In dogs, resistance to infection was not influenced by preoperative scrubbing, regardless of the time interval before operation was performed, or of the dose of staphylococcus used.

HAROLD C. OCHSNER, M.D.

Hartman, F. W., Schelling, V., Brush, B., and Warren, K. W.: Pectin Solution in Shock. *J. Am. M. Ass.*, 1943, 121: 1337.

Pectin is present in citrus fruits, together with cellulose, in a water insoluble form known as "propectin." By acid extraction and alcohol precipitation a pure protein-free pectin is obtained, in powder form. This substance is soluble in hot or cold water, forming a colloidal solution up to 5 per cent concentration. Autoclaving a 1 per cent solution after adjusting the pH to 4.9 gives nearly a water-clear solution, and its molecular weight is 79,000 or within the range of human plasma.

Hartman and his associates have prepared buffered and salted solutions of protein-free pectin. Their method is described fully in the paper. A water-clear solution is obtained, which has a viscosity of from 2 to 4 at 38° C., and an osmotic pressure of from 45 to 70 mm. of mercury, according to the percentage of pectin, from 0.75 to 1.5. The molecular weight varies from 60,000 to 70,000. *In vitro* such solutions increase the sedimentation rate, and this same observation has been made on blood removed after the intravenous administration of pectin. Coagulation time is not affected but the bleeding time is shortened. Autoclaved solutions administered intravenously are well tolerated by dogs, apparently are retained in the circulation for three or four hours, and may in addition even draw some water from the tissues into the blood stream. In experimental shock, pectin solution has proved very effective, and has proved to be far more efficient in replacing blood loss than are electrolyte solutions.

The solution has been administered to 125 surgical patients as a substitute for blood, blood plasma, and electrolyte solutions. Given slowly, the solution has tended to increase the blood systolic and diastolic pressures with an increase in the blood volume which has been well maintained. Satisfactory results were obtained following the use of pectin in 95 per cent of the cases. No complications and no reactions were noted, and no incompatibilities with the blood, blood plasma, or amino acids have been noted. Properly prepared solutions are safe for intravenous use, Hartman states, and of value in the prevention and treatment of shock.

EDWIN J. PULASKI, M.D.

Dodd, H., and Prescott, F.: Methedrine in Surgical Operations. *Brit. M. J.*, 1943, 1: 345.

Of 130 patients observed at operation 54 were found suffering from an unduly low systolic or pulse pressure and some degree of impending surgical shock. The capacity of methedrine (trade name of N-methylamphetamine) to meet the needs of these patients was studied under average general hospital operating conditions. Anesthetics included all those in common use. Under these conditions methedrine has been found to be an effective hypertensive drug with a prolonged action.

The effective dose is from 15 to 30 mgm. given intramuscularly, or from 10 to 20 mgm. given intra-

venously plus a depot dose of from 10 to 20 mgm. given intramuscularly.

In 97 per cent of the cases the systolic pressure was restored to normal levels in a period varying from two to eighteen minutes. The systolic pressure was raised from an average of 66 mm. to an average maximum of 135 mm., and settled to an average minimum of 124 mm. One injection was adequate in 81 per cent of the patients, while repeated injections were given in 17 per cent; 1 case (2 per cent) did not respond. The blood pressure was maintained throughout operation and for several hours after.

Reasons were given for considering methedrine to be superior to adrenaline, ephedrine, pholedrine, neosynephrin, and paredrine for counteracting serious falls of the blood pressure in surgical operations. ERNEST E. ARNHEIM, M.D.

Ebin, J.: The Solid Carbon-Dioxide-Ferric-Chloride Technique for Hemostasis. Experimental Study of Its Effectiveness in Brain, Viscera, and Superior Sagittal Sinus. *Arch. Surg.*, 1943, 46: 386.

The author has developed a new technique for the control of bleeding from the cross-sectional surfaces of vessels in the brain and viscera, and from lacerations of the superior sagittal sinus of experimental animals. This procedure may be effective in human beings and may be of value in war surgery.

The procedure consists of freezing the tissues to obtain a dry field for the application of the coagulant, since the author finds that following the freezing of tissues alone, bleeding occurs with thawing. Shaped blocks of solid carbon-dioxide applied with moderate pressure are used as a freezing agent, and a filtered 20 per cent solution of ferric chloride, which is sterile, is used as a coagulant. The refrigerant must come in contact with all bleeding points for the coagulation to be fully effective. The solid carbon-dioxide must therefore approximately fit the bleeding area. The refrigerant is shaped by a heated knife blade and sharp corners are cut away with a knife. Various sizes and shapes of solid carbon-dioxide are prepared before operation and kept in a vacuum jar until needed. Appropriate forceps are used to handle the refrigerant. The coagulant is applied by means of absorbent cotton, the surrounding tissue being protected with moist cotton, and the excess of coagulant is aspirated.

The technique consists of freezing the bleeding surface for one minute. It may be necessary to manipulate the refrigerant to cover all of the bleeding points. After one minute of freezing the refrigerant is removed and the cotton pellets are soaked in ferric-chloride solution and placed on the frozen part one minute. If blood soaks through the ferric-chloride pellets, they are removed, the bleeding point is located, and the freezing and coagulation are repeated. It was seldom necessary to repeat the freezing and coagulation in the experimented work.

Care must be exercised in brain surgery not to push the refrigerant into a ventricular cavity, since the carbon-dioxide gas given off by the solid carbon-dioxide will expand the cavity. The author states as a dictum, "If the bleeding area communicates with or is directly adjacent to a part of the ventricular system, the procedure is not used."

In 2 animals in which this freezing-coagulation method was used to control bleeding from the superior sagittal sinus, occasional temporary apnea for from ten to fifteen seconds was seen while the dry ice was in place. Respiration returned to normal.

The author examined brain tissue three weeks after it was treated as described and found that bleeding had not recurred and there was no evidence of infection or sterile reaction. Cross-section revealed that the experimentally excised area had been replaced by fibrous tissue with normal adjacent tissue. Similar findings were made on liver and other viscera so treated—the replacement of normal tissue by fibrous tissue, lymphocytes, blood pigment, and fat cells 1.5 mm. deep. EARL O. LATIMER, M.D.

Batterman, R. C., and Mulholland, J. H.: Demerol. A Substitute for Morphine in the Treatment of Postoperative Pain. *Arch. Surg.*, 1943, 46: 404.

Demerol is a new synthetic analgesic for the control of postoperative pain and restlessness. Demerol is 1-methyl-4-phenyl-piperidine-4-carboxylic acid ethyl ester hydrochloride; it was introduced by Eisleb and Schaumann in 1939. Its antispasmodic properties are especially advantageous. Its atropine-like effect combined with sedation makes it an ideal drug for the treatment of colicky pain. Except in hypersensitive persons, demerol may be used without contraindication in patients with severe anemia, disease of the liver or kidneys, or bronchial asthma.

One hundred and sixty-four patients were observed after laparotomy and received the drug parenterally. After procedures other than laparotomy, 91.5 per cent of the patients acted satisfactorily. From 75 to 100 mgm. given parenterally, made the patient comfortable and aided therapy.

Orally, demerol was effective when pain was not so severe and after the acute postoperative symptoms had subsided. Here it was satisfactory in 87 per cent of the cases. Very few untoward reactions were noted. The incidence of vomiting was no higher than one would expect after major operations. There was practically no respiratory depression.

Postoperative complications were also at a minimum. There is no data in regard to abdominal distention and pulmonary complications. The drug does not encourage the accumulation of bronchial secretions. The only disadvantage of demerol is its short action. RICHARD J. BENNETT, JR., M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Davidson, J. N.: Wound Hormones. *Edinburgh M. J.*, 1943, 50: 70.

The "wound hormone hypothesis" supposes that living cells react specifically to injury to elaborate a

substance which initiates wound healing by causing proliferation of intact cells. This hypothesis was first proposed and has been studied with particular reference to plants. It has been demonstrated that wound hormones exist in plants, and their chemical constitution is known. Attempts have been made to extend this hypothesis to the healing of animal tissues. Although it can be shown that biologically active substances are liberated by damaged living cells, such substances might be disintegration products of dead and dying cells rather than material synthesized by living cells.

A review of the evidence from studies on plant wound hormones, yeasts, animal tissues *in vitro*, and on wounds in the intact organism is presented. The evidence from studies on plants and yeasts favors the hypothesis that the growth-promoting factor is a product synthesized by the living cell. The growth of animal tissue cultures is accelerated by the infliction of wounds on the cultures, by adding saline extracts of wounded tissue cultures, or by adding extracts from inflamed tissue. Measurements of the rate of healing of primary and secondary experimental wounds in rabbits showed that wounds inflicted ten or twelve days after the primary wounds healed at a greater rate than the primary wounds. The growth-promoting action of protein degradation products is well known, but these substances cannot be considered wound hormones unless it can be shown that they are produced as a specific response to injury and, further, that they have a specific catalytic activity as growth stimulants rather than general nutritive properties.

JOHN L. LINDQUIST, M.D.

Rosenberg, N.: The Use of Detergents in the Cleansing and Local Treatment of Burns. *Surgery*, 1943, 13: 385.

Most workers are of the opinion that vigorous cleansing methods have no place in the preliminary treatment of burns because: (a) anesthesia is required, (b) shock is thereby increased, and (c) injury to remaining healthy tissue results from scrubbing and the use of irritating cleansing agents.

In many cases the tanning or coagulation method of local treatment would seem to possess the advantages of: (a) simplicity of application, (b) prevention of fluid, electrolyte, and protein loss from the burned area, (c) prevention of subsequent exogenous infection, provided proper after-care of the eschar is carried out, (d) rapid easing of pain, and (e) the facilitation of subsequent nursing and transportation. Infection arising from beneath the eschar speaks for the inadequacy of preliminary procedures. More recently, methods of treatment other than tanning have been recommended. These also have been discussed.

Certain of the synthetic detergents, employed in one of several combinations, act as cleansing agents in the local treatment of burns. These agents are superior to other cleansing agents because of: (a) their ability to penetrate and solubilize substances such as greases, oils, and fats, as well as particular matter (these types of contaminants are thus rendered more easily removable by water); (b) their lack of either irritating or noticeable tissue-damaging properties as employed; (c) their antiseptic nature; and (d) the fact that, after all grease, including the normal skin oils, is removed, the subsequent "take" of dye or tanning is rendered easier, and a proper eschar is more readily formed.

The principle of employing a penetrant detergent, such as sulfonated petroleum, as a carrier for other more powerful detergents is especially valuable, since it greatly diminishes the amount of mechanical dispersion required to distribute the cleansing solution uniformly throughout an oil or grease layer.

In clinical tests with a number of detergent mixtures, performed on controls with relatively mild, second-degree burns, the reasons for the superiority of some, as given, were substantiated. More than three-quarters of the burns when first observed in the emergency service of a metropolitan hospital were covered with grease, oil, fats, or ointments. It is in this group of cases, especially, that the action of the synthetic detergents is best demonstrated.

Burns covered with grease and oil, the result of military engagements on sea and land, represent a problem in which the application of these new cleansing agents may be of specific benefit.

J. M. MORA, M.D.

Matson, D. D.: The Use of Tannic-Acid Jelly in Experimental Burns. *Surgery*, 1943, 13: 394.

Tanaburn, a 10 per cent tannic-acid jelly in a water-soluble base, in itself, is sterile.

A small amount of tanaburn exerted no bacteriostatic effect on pure cultures of the beta hemolytic streptococcus, staphylococcus aureus, and bacillus coli growing in blood-agar media.

The beta hemolytic streptococcus will not grow in tanaburn alone. This does not mean that tannic-acid jelly is bactericidal, but that it does not provide a media sufficient to support the growth of the organisms.

The beta hemolytic streptococcus is readily recultured from burned and infected skin at the end of five hours. If this infected burn is covered with tanaburn, similar cultures taken at one, three, five, and twelve hours and incubated for two hours show no growth. However, if these cultures are allowed to incubate for forty-eight hours, then the three-, five-, and twelve-hour cultures show increasing numbers of colonies of hemolytic streptococci. Tanaburn, therefore, is not a bactericidal for these organisms, since they eventually grow out in profusion, but a definite bacteriostatic effect is evidenced by the absence of growth in the one- and three-hour cultures from both the flame and hot-water burns.

Tanaburn begins to form an eschar on burned skin between three and five hours. This is quite thick and pliable, and cannot be washed or wiped from the skin at twelve hours. Tanning the burned

skin has no effect on the amount of subcutaneous edema present at the end of five hours.

J. M. MORA, M.D.

Elman, R.: Early Mortality of Burns as Influenced by Rapid Tanning and by Transfusions. *Ann. Surg.*, 1943, 117: 327.

A statistical analysis was made of 78 fatal cases among 427 severe burns, with special reference to the probable influence of therapy on the early mortality. It seemed clear that the following three factors alone or in combination contributed to early mortality: (1) the use of noncoagulation methods of therapy; (2) failure to use plasma transfusions or to use them in inadequate amounts; and (3) failure to precede local by systemic therapy.

The inference seems justified that the reduction of early mortality depends upon giving rigid priority to methods which minimize or correct plasma loss and which thus combat, early and rapidly, the systemic manifestations due to loss of plasma. The problem of toxemia as a cause of early deaths is discussed briefly. STEPHEN A. ZIEMAN, M.D.

Bodenham, D. C.: Restoration of Function of the Burned Hand. *Lancet*, Lond., 1943, 244: 298.

With modern methods of treatment in the Royal Air Force a high percentage of flying personnel who have received severe burns have been able to return to full flying duties. The author bases his observations on the treatment in these units.

The first principle is the maintaining of a basic position of the hand. This is a slight dorsiflexion at the wrist, midflexion of all finger joints, and apposition of index finger and thumb. The hand is maintained in this position by the use of a splint, preferably metal. The splint is made from a plaster cast made from an average hand. This splint projects beyond the finger tips to give them protection. In severe cases, with much edema, the hand is coaxed over the splint over a period of forty-eight hours. The fingers are separated by a suitable dressing and the hand is maintained in an elevated position.

Movement of the burned hand should be encouraged as soon as the swelling has been controlled, and this movement may be safely continued unless the patient develops pain, an increase in the swelling, or any subsequent stiffness. With second-degree burns, this movement may start within a day or two of the injury. With more severe burns movement should be limited according to the extent of the injury. When the full thickness of the skin has been burned over the dorsum of the hand and fingers, two weeks of initial rest are advised. If tendons are exposed and joints destroyed, from three to four weeks of complete and continuous rest are advised. When finger-joint cavities are exposed, fibrous fusion should be permitted, with the hand fixed in the optimum position. These hands still maintain some function, whereas a hand with fingers fixed in extension is useless. All movements of the burned hand should be active, passive movements should never be allowed, nor should the hand ever be manipulated under anesthesia to improve its position. During the course of treatment, the surgeon should be satisfied with any improvement, however small, rather than attempt too much and produce a reaction. MARIAN BARNES, M.D.

Boehringer, F.: The Treatment of Wounds with Chlorophyll Salve (Zur Wundbehandlung mit Chlorophyllsalbe). *Schweiz. med. Wschr.*, 1942, 72: 850.

The author reports his experiences with 8 cases of chronic ulceration of various types and causes treated by the application of chlorophyll salve. In 7 instances, granulation-tissue stimulation and epithelization were observed to be more pronounced than with control applications. Also in 5 other cases healing was thought to have been stimulated by the application of chlorophyll salve. Details as to how the ointment is compounded are not given.

ALEXANDER BRUNSCHWIG, M.D.

Scott, J. V.: Pilonidal Cyst. The Local Use of Buffered Sulfanilamide in Primary Closure. *Ann. Surg.*, 1943, 117: 191.

The problem of pylonidal cyst is encountered with greater frequency by the Army surgeon than by the civilian physician. Several factors play a role in this higher incidence, mainly: the patients are entirely males of the younger age group, the increased physical activity, and the high incidence of direct trauma or chronic irritation at the upper border of the gluteal cleft. In this article the author, a captain in the United States Army Medical Corps, presents an analysis of the immediate results in wound healing of 94 cases of pylonidal cyst in which primary wound closure was attempted.

All of the patients presented definite symptoms, as pain, discharge, itching. They had never been treated before. In 56 of the 94 cases no preoperative topical treatment was used with the exception of injection of the sinus openings with methylene-blue solution to outline the diseased tissue areas. In the other 38 cases, in which infection was grossly apparent, incision and drainage were done first.

The open pack method following excision and the wound flap technique were not used because in the first hospitalization is necessarily prolonged and the resulting wider, tender, thinly epithelized scar is a discomfort to the soldier in his military life, and in the second the realignment of tissues is not anatomical and the sacrococcygeal fascia is deprived of its protective layer of fat. The technique used is based essentially on the careful dissection of the sinuses so as to sacrifice the minimal amount of normal skin and subcutaneous tissue. To avoid wide separation of the wound edges spur incisions at right angle to the main vertical incision are made when necessary to dissect the lateral ramifications of the sinus tracts.

Postoperative attempts to obliterate potential or actual dead spaces by means of gauze rolls, pressure

dressings, and placing the patient on his back were avoided to eliminate any interference with the local circulation. Such obliteration was accomplished at the time of operation by a deep suture layer in the vertical plane.

The recent work of Schmelkes and associates demonstrated that the anion of the sulfonamides is the agent that contributes mostly to the antibacterial effectiveness of sulfonamide solutions and that the difference between various sulfonamides is based directly upon the degree of their acidic dissociation and indirectly upon the pH of the wound. On this basis the author used a preparation of buffered crystalline sulfanilamide containing 10 per cent of calcium carbonate. The drug preparation was sprinkled in all portions of the wound cavity and over the cutaneous suture line. This method markedly reduced the percentage of postoperative wound infection, which effect plain sulfanilamide failed to produce.

The local use of buffered sulfanilamide in traumatic war wounds is suggested.

CONRAD L. PIRANI, M.D.

Browning, C. H.: Aminoacridine Compounds as Surface Antiseptics. *Brit. M. J.*, 1943, 1: 341.

Aminoacridine ("flavine") compounds were introduced as surface chemotherapeutic agents for war wounds because they combined outstanding antiseptic properties with relatively low toxicity, as demonstrated by simple methods *in vivo* and *in vitro*. Proflavine is the precursor of acriflavine, and is cheaper. Also, while equally antiseptic, proflavine is the less toxic generally, and in addition, is only very slightly harmful to brain tissue.

It has been shown under experimental conditions that the flavines when applied to the tissues at the site of inoculation are highly effective in preventing the development of infection with various organisms, including the streptococci and certain gas-gangrene anaerobes. Also, there is good clinical evidence that they can control established suppuration in wounds. This may occur when drugs of the sulfonamide group have failed. Retardation of granulation and healing tends to follow the continued use of the flavines, so that it may be advantageous to resort to other treatment later. ERNEST E. ARNHEIM, M.D.

ANESTHESIA

Southworth, J. L., Edwards, W. B., and Hingson, R. A.: Continuous Caudal Analgesia in Surgery. *Ann. Surg.*, 1943, 117: 321.

Continuous caudal analgesia has several advantages worthy of consideration for use in general surgery. It is a safe procedure and relatively easy to administer and control. It is a valuable anesthetic method in operations about the lower extremities and perineum, particularly in the aged, debilitated, or recently shocked patients. It would seem adaptable also in the treatment of casualty patients during their transportation, and in physical and roentgenological examinations of the injured. Another field of usefulness is in the treatment of thrombophlebitis and embolism of the lower extremities; in this affection the block is maintained for from four to six hours followed by a four-hour rest with the needle in place. For the second period, a block of four hours' duration is then administered.

Two hundred and fifty-five cases in general surgery are reported. There were only 3 failures of the analgesia to reach the desired somatic level. An increased tendency toward bleeding was noted from the cut skin edges. The presence of motor function in the extremities during and immediately after the operation tends to promote movement on the part of the patient, a condition thought to favor the prevention of thrombosis and embolism. In urological operations the advantage of complete lower analgesia without the dangers inherent to spinal anesthesia is obtained.

With the caudal set-up used at the present time, no accidents involving broken needles have occurred. A special malleable No. 19-gauge needle is inserted into the caudal hiatus. After the proper position of the needle is ascertained, an average of 50 cc. of 1½ per cent metycaine in physiological saline solution is injected. In the average patient, analgesia will be complete from the umbilicus downward after from twenty to thirty minutes. If the analgesia is progressing satisfactorily, there will be a flushing of the toes and feet which occurs in five to fifteen minutes after injection. Twenty cubic centimeters given every thirty or forty minutes usually suffice as supplementary injections. It was found that when larger amounts than those suggested were injected, analgesia to the clavicles could be often obtained.

The chief disadvantages are the time consumed in the administration, and the prolonged period during which analgesia is incomplete—a matter of from thirty to forty minutes usually, although a skilled anesthetist can often get the patient ready for surgery in ten minutes. Occasionally a transient mild syncope follows the initial injection. One moderately severe infection occurred around the sacral hiatus. MARY KARP, M.D.

Block, N., and Rochberg, S.: Continuous Caudal Anesthesia in Obstetrics. *Am. J. Obst.*, 1943, 45: 645.

The authors made several changes in the technique of caudal anesthesia for obstetrics as described by Edwards and Hingson as they believed that these innovations would increase the safety factor. A 1 per cent procaine solution was used instead of 1.5 per cent metycaine as it was shorter-acting and less toxic. In addition, in order to eliminate the large injected doses given by the syringe method, which Edwards and Hingson employed, they devised a means of giving the procaine by a continuous gravity drip. This was done to simplify the procedure and to decrease the attendant risks of large, rapidly injected doses of the anesthetic agent.

Although there were no fatalities in this series, the authors believe that no matter how the procaine is administered, the danger of an anesthetic death is still very real. Despite its many advantages, continuous caudal anesthesia is not a procedure to be used indiscriminately. The inherent risk of introducing the needle unknowingly into the spinal canal is constantly present. This type of anesthesia may have a place in cases in which other forms of analgesia or anesthesia are contraindicated; it is as safe as the anesthetics now commonly employed. Its use should not become routine, particularly in smaller hospitals where a competent anesthetist is not always available to cope with the serious complications resulting from an accidental introduction of the anesthetic agent into the spinal canal.

EDWARD L. CORNELL, M.D.

Snyder, F. F., and Geiling, E. M. K.: Action of Morphine in Obstetrical Analgesia. *Am. J. Obst.*, 1943, 45: 604.

Increased incidence of stillbirths following the administration of morphine during labor in rabbits is due to the effect upon the mechanism of labor chiefly, rather than to a direct effect upon the fetus. Fetal mortality in the birth of 890 fetuses obtained from 137 litters was as follows: (1) normal controls, 12 per cent; (2) after morphine, 13 mgm. per kgm. at thirty-one days, i.e., the onset of labor, 57 per cent; after morphine, 13 mgm. per kgm. at twenty-six days, i.e., before the onset of labor, 12 per cent; after morphine, 1 mgm. per kgm., i.e., an analgesic dose, at thirty-one days, 23 per cent. Stillbirths were not uniformly distributed but involved chiefly certain litters as follows: (1) normal controls 12 per cent of the litters; (2) after morphine, 13 mgm. per kgm., at thirty-one days, 59 per cent; after morphine, 13 mgm. per kgm., at twenty-six days, 10 per cent; after morphine, 1 mgm. per kgm., at thirty-one days, 20 per cent of the litters. Similarly, marked prolongation of labor was noted in certain litters, the incidence being, respectively: (1) 10 per cent, (2) 41 per cent, (3) none, and (4) 16 per cent. Prior to the onset of labor, the fetuses were alive, and they survived despite the administration of morphine to the maternal animal in large dosage (13 mgm. per kgm.), as shown in the following experiments:

1. By direct observation of the intrauterine respiratory movements during a period of two hours or longer, it was found that rhythmical breathing of the fetuses was depressed but not altogether abolished.

2. By hysterotomy, in contrast to expulsion through the birth canal, fetuses were regularly delivered alive at intervals of from twelve minutes to fifteen hours following injection.

3. By measurement of the time of survival of fetuses when breathing nitrogen instead of air, it was found that following morphine the resistance to anoxia was not decreased.

In considering the clinical use of morphine in obstetrical analgesia, it is of interest to note that under controlled experimental conditions morphine definitely increased the fetal mortality by injury of the mechanism of labor, and, following a dosage within the range employed therapeutically, the frequency of labor with unfavorable outcome was doubled. Since the prognosis regarding the functional efficiency of the labor mechanism depends upon direct observation during labor, it is clear that there is reason to limit the administration of morphine until evidence of normal function is obtained.

EDWARD L. CORNELL, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Zwerling, H., and Nelson, W. E.: The Roentgenological Pattern of the Small Intestine in Infants and Children. *Radiology*, 1943, 40: 277.

There are several articles in the literature suggesting that "clumping" in the roentgenograms of the small intestine of infants and children is characteristic of the celiac syndrome and a variety of clinical conditions due to deficiency of the Vitamin B complex, and that the transition from the "infantile" to the "adult" pattern occurs at four or five months of age. Doubt that abnormal intestinal patterns are necessarily indicative of pathological conditions in children beyond the age of infancy was raised by the authors when a presumptive diagnosis of the celiac syndrome was made on the basis of roentgenological studies of the small intestine in several children who had no clinical manifestations of the disease. For this reason, the authors carried out a series of experiments to determine the type of roentgen pattern to be expected and, especially to determine if there is a definite chronological transitional period during which a change from the "infantile" to the "adult" pattern occurs.

Seventy-seven infants and children, ranging in age from three months to eleven years, were studied. After an overnight fast, the children were given from 1 to 2 oz. of a barium-water mixture. In children over one year of age, equal parts of plain barium sulfate and boiled tap water were employed. For infants, 3 parts of water and 2 parts of barium were used. Roentgenograms were made thirty minutes after the ingestion of the barium and at intervals of from thirty to sixty minutes until the barium had progressed to the distal ileum or to the cecum.

All in all, the studies of the roentgenograms led to the conclusion that the small intestinal pattern of infants and children may show such wide variations even in the normal that it cannot be considered a reliable criterion for the diagnosis of nutritional deficiency states. T. LEUCUTIA, M.D.

Lenz, M.: X-Ray Treatment of Diseases of the Larynx. *Ann. Otol. Rhinol.*, 1943, 52: 85.

X-ray therapy is an important aid in the treatment of diseases of the larynx. The treatment is based not only upon proficiency in radiotherapeutic technique and adequate x-ray equipment, but as much upon familiarity with the local anatomy, with the natural course of the untreated disease, with the extent of the disease on admission, and the radiosensitivity of the treated normal and pathological tissues.

Lenz points out that in choosing the best treatment for cancer of the larynx, the advantages and limitations of surgery and x-ray therapy, and, in a limited way, of radium or radon therapy should be considered in each particular case. The decision is influenced by the location, the local extent, the presence of metastases, and the invasive tendency of the cancer. The best method of solving individual problems is by consultation between the laryngologist and the radiologist. A joint follow-up clinic will help to standardize criteria on which to base the choice of treatment routinely.

NOAH D. FABRICANT, M.D.

Watson, W. L., and Urban, J.: Million-Volt Roentgen Therapy for Intrathoracic Cancer. Palliative Effects in a Series of 63 Cases. *Am. J. Roentg.*, 1943, 49: 299.

The treatment of early, primary, intrathoracic cancers is generally conceded to be surgical. At Memorial Hospital, the resectability rate of cancer of the esophagus amounted to 43 per cent (11 of 26 cases) and of cancer of the lung to only 20 per cent (3 of 15 cases).

Since 1939 a series of intrathoracic cancers was treated by a million-volt roentgen apparatus, with 1,000 kv.; a filter combination of 2 mm. of mercury, 2 mm. of tungsten, and 8 mm. of copper; a current of 3 ma.; a skin target distance of 70 cm.; and an intensity of 52.4 roentgens per minute. The authors now report the results obtained in 63 inoperable cases so treated between August, 1939, and December, 1940. The group includes 33 cases of cancer of the lung, 21 cases of cancer of the esophagus, 3 cases of cancer of the lower esophagus and stomach, 1 case of thymoma, 1 case of advanced malignant giant-cell tumor of the sternum, and 4 cases of pulmonary metastases.

A symptomatic improvement of four months was obtained in 84 per cent of the cases of cancer of the lung, and of five months in 55 per cent of the cases of cancer of the esophagus.

So far this study does not lend hope that million-volt roentgen therapy may lead to a high percentage of five-year survival. T. LEUCUTIA, M.D.

RADIUM

Emerson, E. B., Jr., and Dowdy, A. H.: Radium Therapy as an Aid in the Control of Chronic Otorrhea. *Am. J. Roentg.*, 1943, 49: 234.

The authors present some evidence that, in certain selected cases of chronic otorrhea, radium irradiation of the eustachian orifice may be of value in controlling the condition.

The cases chosen were those in which the persistent otorrhea appeared as the result of hypertrophy of the lymphoid tissue in and about the eustachian orifice. If there was evidence of concomitant lesions of the upper respiratory tract, such as deviated nasal septum, sinus infection, tonsil infection, and

adenoids; if the middle ear was affected by polyps, granulations, and caries of the ossicles; or if, finally, there was superimposition of active mastoiditis; the results remained unsatisfactory.

The radium treatment was carried out with a minimum amount of 25 mgm. distributed in two equal needles of 0.3 mm. wall thickness and composed of an alloy of 8.7 density. Such a needle transmits 99.2 per cent gamma rays.

The applicator for holding the needles *in situ* is described as follows:

The entire applicator consists of three parts—the head, cap, and handle. The head is composed of two parallel chambers open at one end, and with brass walls 1 mm. thick. It is 3 cm. long, 0.6 cm. wide, and approximately 3.5 mm. thick. There is an oval window 1.5 cm. long on one side of the head so that when it is placed in its treatment position against the os of the eustachian tube the radium is unfiltered other than through the filter supplied by the walls of the needles. When loaded for treatment each chamber of the head holds one 12.5 mgm. radium needle. The cap holds the two needles in place. It is an oval, flat piece of brass, 1 mm. thick, and of sufficient size to cover the open ends of the chambers in the head. There is a small hole in one end of the cap just large enough to allow the passage of the threaded end of the semiflexible steel wire handle. On the other end of the cap and on the underneath side is a small steel plug which fits into the open end of one chamber of the head. The open end of the other chamber is threaded. When the threaded end of the handle is screwed into this, it not only retains the needle in place in the chamber, but also holds the cap on, which in turn secures the other needle firmly in its chamber. The semiflexible wire handle is 13.4 cm. long.

In practice, two such applicators, one the mirror image of the other, may be used simultaneously. Following local anesthesia with 2 per cent pontocaine, the head of the applicator is passed through the inferior nasal meatus with the oval window in the head toward the lateral wall. Because of its shape, the applicator will drop into position in contact with the os of the eustachian tube and will remain so throughout the treatment. The average dose amounts of 5 mgm.-hr., or approximately one-third of an erythema dose on each side, requiring a treatment time of twelve minutes. Occasionally a second treatment with a like dose is necessary in from six weeks to three months.

The results obtained in a selected group of 30 cases of chronic otorrhea were collected and arranged tabularly. Healing with complete repair of the tympanic membrane occurred in 4 cases, although in some the otorrhea was of from ten to twenty years' duration. In the other cases the healing was of various degree. Five patients had recurrence of the otorrhea following swimming or reinfection. Failure occurred in only 3 of all the cases.

The brief histories of 4 cases are included to illustrate the effectiveness of the treatment and also to show the effect on the hearing curve.

It is emphasized that one may expect a permanent cure only in those cases in which the healing was followed by complete repair or scarring of the drum. In the presence of persistent tympanic perforations, recurrence of the otorrhea remains a constant possibility.

T. Leucutia, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Dowling, H. F., and Lepper, M. H.: Toxic Reactions Following Therapy with Sulfapyridine, Sulfathiazole, and Sulfadiazine. *J. Am. M. Ass.*, 1943, 121: 1190.

Sulfapyridine was administered to 498 patients with toxic effects in 29.9 per cent, sulfathiazole to 321 patients with toxic effects in 11.8 per cent, and sulfadiazine to 660 patients with toxic reactions in 7.7 per cent. A detailed analysis was made of the toxic reactions encountered after the use of each of these drugs.

Renal calculi were found least frequently in patients treated with sulfadiazine or sulfapyridine. Their frequency varied in direct proportion to the maximum level of free sulfonamide in the patient's blood. None occurred in patients given 0.5 gm. of sulfadiazine or sulfathiazole every four hours or less. When larger doses of these drugs were given, renal calculi occurred when fluid output was diminished for some reason. Blood dyscrasias occurred less frequently following sulfadiazine and sulfathiazole treatment.

The only death in the entire series which might be partly attributable to sulfonamide therapy occurred in a patient with acute hemolytic anemia following sulfapyridine therapy. The optimal therapy for most infectious diseases at the present time involves the use of sulfadiazine, in low doses whenever possible but in high doses when necessary, provided there is careful regulation of the fluid intake and output and frequent blood counts and urinalyses combined with close observation of the patient.

Thorstad, M. J., Saltzstein, H. C., and McAlpine, A. D.: Trends in General Surgery. *Ann. Surg.*, 1943, 117: 297.

This is a review of five years of surgical experience at Harper Hospital, Detroit, Michigan. The hospital is a 600 bed hospital, of which about 250 beds are for patients undergoing general surgery. There are 110 general surgeons on the staff, 12 of whom perform two-thirds of the major surgery. The institution is preponderately private. The authors review their surgical experiences from 1937 to 1941, inclusive.

There were 47,316 surgical admissions and 18,988 major operations. The average mortality rate was 3.2 per cent with 622 operative deaths. There were 368 nonoperative deaths (1.9 per cent).

Appendectomy was the most frequently performed operation. In 1941 there were 1,502 appendectomies, representing 35.5 per cent of all the major operations. In 1941 the mortality rate was 0.3 per cent (5 deaths). There were 5 deaths in which the pathological report was chronic catarrhal appendicitis; these were due to: (1) acute massive bilateral pneumonia, (2) toxic hepatitis and hemorrhage into the great mesentery, (3) aspiration pneumonia in a case in which a cholecystectomy was performed also, (4) pulmonary infarction in a case in which the primary operation was for strangulated inguinal hernia, (5) pulmonary edema and acute tubular nephrosis. In general, the tendency was to operate on cases of ruptured appendicitis early, without waiting for localization, but once it had occurred the tendency was to wait longer. In 1941 there were 41 appendectomies performed for ruptured appendicitis with abscess or generalized peritonitis, without a death.

There was a decided increase in the number of cholecystectomies performed during this period. In 1941, there were 217 cholecystectomies, of which 193 were for chronic cholecystitis, with 2 deaths or a 0.9 per cent mortality. Cholecystostomy was done in 30 cases with 1 death (3.3 per cent mortality); in 19 cases it was done for chronic and in 11 for acute cholecystitis.

Gastrectomy increased with a constant mortality rate of from 20 to 25 per cent, whether it was done for carcinoma or peptic ulcer. The number of gastroenterostonies was constant from 10 to 15 cases, with a mortality rate of 41 per cent in 1941. Gastrostomy and enterostomy were not commonly performed. Enterostomy is being replaced by the use of the Miller-Abbott tube. Among the 11 cases treated in 1941, there were 2 deaths (18 per cent mortality). The mortality rate for perforated peptic ulcer treated surgically was approximately 22 per cent.

The total number of radical resections of the colon and rectum increased during the past few years. There were 31 resections of the colon above the rectosigmoid junction performed by a modified Mikulicz technique with a mortality rate of 6.5 per cent in 1941. Abdominoperineal resections of the rectum for adenocarcinoma increased, with only a single fatality (6 per cent) among 16 resections in 1941. Seven perineal resections were done in 1941 with a mortality of 14 per cent.

The number of hysterectomies increased 50 per cent in the past four years with a mortality of 0.7 per cent in 1941. There were no deaths from total hysterectomy in 1941 and 40 per cent of all the hysterectomies were total.

Each year there are 6 or 8 major abdominal wound disruptions, with a mortality rate of 30 per cent. Hysterectomy accounted for 25 per cent of these, and cholecystectomy and appendectomy for 17 per cent of them each.

During 1941, 700 hernioplasties were performed. There were 3 deaths (0.4 per cent mortality), of which 2 occurred in cases of strangulated hernia. There was an occasional death in each classifica-

tion, but the most regular death rate occurred in the small group of strangulated hernias.

Subtotal thyroidectomy was done most frequently of the thyroid operations. There were only 33 multiple-stage operations done in the past five years. In 1941 the mortality rate for thyroidectomy was 0.7 per cent (3 deaths in 286 cases). There were 9 cases of carcinoma of the thyroid gland.

The number of mastectomies, chiefly simple mastectomies, is increasing, and there has been no surgical death in the five-year period. Roentgenotherapy, especially the preoperative type, is decreasing.

Major amputations are decreasing, especially in diabetic patients. There were no deaths in 13 major amputations performed in 1941.

Fifty-five per cent of the patients received gas-ether anesthesia. Twenty-five per cent were operated upon under spinal anesthesia, either alone or supplemented with inhalation anesthesia. Cyclopropane, ethylene, avertin, and evipal were not administered during 1941, but intravenous sodium-pentothal anesthesia has become very popular.

This hospital has had a blood bank since May, 1939, which has resulted in: (1) almost complete elimination of direct blood transfusions; (2) a great increase in the indirect transfusion technique; and (3) an increasing administration of plasma transfusions. LEROY J. KLEINSASSER, M.D.

Mulholland, J. H., Co Tui, Wright, A. M., and Vinci, V. J.: Nitrogen Metabolism, Caloric Intake, and Weight Loss in Postoperative Convalescence. *Ann. Surg.*, 1943, 117: 512.

These extensive studies are similar to the work of other observers, differing in two major respects. The first point of difference is the utilization of the absorbing surface of the intestines beyond the point of operative trauma for the absorption into the system of a feeding mixture which requires the minimum of digestive effort. The utilization of the feeding tube and this mixture obviates the difficulties which usually bar the way to immediate postoperative feeding. The second point is the adherence to a caloric and nitrogen intake which fully replaces the losses resulting from the operation.

The nitrogen balance, body weight, and plasma proteins of 4 patients with duodenal ulcer, treated after partial gastrectomy by the standard ward routine were followed up for from seven to twelve days. There was found to be in all of these cases a cumulative nitrogen deficit, a progressive loss of body weight, and a suggestive progressive fall of plasma protein concentration.

In another group of 4 patients who had a similar operation for a similar condition, the caloric and nitrogen balance was maintained by tube feeding with an easily assimilable mixture. In these patients there was a positive nitrogen balance, a cumulative nitrogen surplus, and a progressive rise of body weight and of plasma proteins; there seemed also to be a minimum amount of postoperative asthenia.

The experiments are reported in detail. Emphasis is laid on the fact that blood and plasma transfusions cannot be depended upon as the sole caloric and nitrogen supply for the body. It is suggested that it may be safer for surgeons to set a higher "lower limit of normal" of plasma protein concentrations for surgical patients than is required in other specialties. HAROLD C. OCHSNER, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Kleiger, B., and Blair, J. E.: The Role of Toxin and Use of Antitoxin in Systemic Staphylococcal Infections. *Arch. Surg.*, 1943, 46: 548.

Certain strains of staphylococci will produce a potent exotoxin under special *in vitro* conditions.

When this exotoxin is injected intravenously into experimental animals it causes a characteristic response ending in the death of the animal.

When toxigenic staphylococci are injected intravenously into experimental animals, they are capable of producing exotoxin *in vivo* with the resultant characteristic response.

Systemic infection by toxigenic staphylococci in human beings who are susceptible to the toxin is associated with clinical symptoms which are characteristic and readily recognizable.

This exotoxin can be neutralized *in vivo* by commercial staphylococcus antitoxin which produces dramatic and life-saving results when properly administered. The use of staphylococcus antitoxin in certain cases exhibiting the characteristic features of staphylococcal toxemia is recommended as a valuable adjunct to their therapeutic management.

JOHN J. MALONEY, M.D.

Jern, H. Z., and Meleney, F. L.: Studies in Bacteriophage. The Behavior of Staphylococcus Bacteriophage in Human Serum and Blood. *Surgery*, 1943, 13: 434.

Nearly all normal human sera, undiluted or in a 50 per cent dilution, prevent bacteriophage lysis of bacteria in liquid medium *in vitro*. There is some effect, permanent or passing, with dilutions of 1 in 10 and 1 in 20, but higher dilutions are generally infective. Repeated subcutaneous, intramuscular, and intravenous injections of bacteriophage into human beings or experimental animals may increase the phage-inhibiting power of their serum up to a level of complete phage inactivation. This antiphage is either very much more potent than, or of an entirely different nature from, that found in normal individuals. Defibrinated or citrated blood also may inhibit staphylococcus-bacteriophage lysis.

On the basis of these findings, investigators have been led to believe that bacteriophage is inactivated within the body. However, observations on bacteriophage action *in vivo* do not fully support this idea. The recovery of bacteriophage from the body is difficult to explain on the basis of complete phage destruction by the blood or other body tissues.

Potent staphylococcus phage has frequently been found in the exudate from a human lesion caused by staphylococci.

Bacteriophage injected intravenously either into normal patients or animals, however, can only rarely be recovered from the blood after twenty-four hours. This is due in part to the excretion of phage in the urine, from which it can be readily recovered. However, the delay in the growth and the character of the colonies on blood agar plates when transplanted from broth blood cultures in cases of staphylococcus septicemia suggest the continued activity in the blood from twenty-four to forty-eight hours after intravenous injection. Furthermore, bacteriophage injected locally into furuncles and carbuncles may, in some cases, persist for a week and yet the serum of one such patient inhibited phage lysis in high dilutions in liquid as well as on solid media.

Continuing the investigation of this subject, the blood and serum of 15 individuals were repeatedly examined by Jern and Meleney. Four of these were suffering from chronic furunculosis of several months' or years' duration; 10, classified as normal, were completely well; but 2 had had occasional staphylococcus infections in the past. One individual had received previously 12 subcutaneous injections of phage in an attempt to prevent recurrent boils, and had built up a strong phage-inhibiting factor in the serum (antiphage).

In the series studied, 50, 66, and 100 per cent serum, as well as undiluted, defibrinated, and heparinized blood, were used. The serum dilutions represent the limits of the actual concentration of plasma in the blood.

The results indicated that all specimens of human blood brought into contact with undiluted staphylococcus phage containing a specified average number of corpuscles per cubic centimeter in the absence of bacteria produced a gradual inactivation of the phage, which was most marked within the first twenty-four hours, and after from seven to fourteen days all of the phage was usually destroyed.

Human serum produced a similar phage-inactivating effect, the degree of inactivation depending on the concentration of serum; undiluted and 66 per cent serum possessed a higher phage-inhibiting effect than whole defibrinated or heparinized blood, and 50 per cent serum had a slightly lower effect.

There was no significant difference in the phage-inhibiting effect between the blood or serum of individuals suffering from chronic furunculosis and the blood or serum of normal people.

It was found that the survival and lytic power of phage in blood probably depends to a considerable degree on the concentration of phage corpuscles. If this number exceeds the amount which the blood can destroy, multiplication of phage in the blood may subsequently take place.

The use of staphylococcus phage in certain dilutions containing a certain average number of corpuscles in blood in the presence of susceptible bacteria makes it possible to distinguish between those bloods which will and those which will not allow the multiplication of phage corpuscles.

On the basis of these experiments it is believed that multiplication of phage takes place in blood and other body fluids *in vivo* provided that a sufficiently large amount of potent phage is used.

STEPHEN A. ZIEMAN, M.D.

DUCTLESS GLANDS

Schneeberg, N. G., Likoff, W. B., and Meranze, D. R.: An Evaluation of the Blood Test for Galactose Tolerance in the Diagnosis of Hyperthyroidism. *Arch. Surg.*, 1943, 46: 581.

The authors have found the blood test for galactose tolerance a valuable adjunct in the diagnosis of hyperthyroidism. The test consists of determining the concentration of galactose in samples of venous or capillary blood thirty and sixty minutes after the oral administration of 40 gm. of this substance to a patient who has fasted over night. The authors consider values under 20 mgm. per cent as normal, from 30 to 40 mgm. per cent as doubtful, and over 40 mgm. per cent as indicative of decreased galactose tolerance. They were unable to find any correlation between the bromsulfalein and/or, the hippuric-acid synthesis test and the galactose tolerance test in 45 patients so studied.

The authors noted that the test is positive in 92 per cent of the cases reported in the literature. They conclude that the test is useful in excluding the presence of hyperthyroidism in patients with hypermetabolism due to causes other than hyperthyroidism. They consider the test unreliable in the diagnosis of hyperthyroidism in patients in whom thyroidectomy has previously been performed for hyperthyroidism, in patients with decompensated heart disease, and in patients suffering from peptic ulcer, hepatic insufficiency, or Paget's disease.

The fact that the test may be positive in any one of the heterogeneous disease entities mentioned and is rarely negative in the presence of hyperthyroidism emphasizes the value of the test in excluding the diagnosis of hyperthyroidism rather than in establishing the diagnosis. EARL O. LATIMER, M.D.

Lord, J. W., Jr., Andrus, W. DeW., and Stefko, P.: The Effects of Jejunal Transplants on the Experimental Production of Peptic Ulcers. *Arch. Surg.*, 1943, 46: 459.

The authors recently described the effects on the gastric secretion of transplantation to the stomach of a segment of jejunum with an intact blood supply. Briefly, they observed that in 5 animals subjected to this procedure the normal response of increased acidity after the injection of histamine was reversed in 4 and markedly reduced in 1, as demonstrated by direct measurements of the pH of the gastric mucosa of seven regions of the stomach. This same reversal was also strikingly evident in the analyses of the gastric contents, which showed a reduction of the average fasting free and combined acidities after

jejunal transplantation, followed by a still further decrease after the injection of histamine.

This paper deals with the effects of such jejunal transplants on the experimental production of peptic ulcers of the duodenum and the daily intramuscular injection of a mixture of histamine phosphate and beeswax in liquid petrolatum. In view of the effects of the jejunal transplants in normal animals when the usual amount of histamine phosphate (1 mgm.) was injected for gastric analysis, it was believed desirable to investigate the effects during more prolonged exposure to the drug. To this end two series of experiments were carried out.

In the first series, 2 control dogs and 2 dogs in which a jejunal segment with an intact blood supply had been implanted into the stomach about two and a half months previously received intramuscular injections of a mixture of histamine and beeswax equivalent to 120 mgm. of histamine phosphate daily, except Sunday, for a period of thirty days. At the end of the thirty-day period gastric analyses were carried out, after which all 4 animals were killed and the gastrointestinal tract carefully examined. The fasting free acidity was much lower in the experimental than in the control animals despite the prolonged exposure to histamine. Also, the previously noted reversal of the normal response of increased acidity ten and twenty minutes after injection of histamine was seen in these animals. On the other hand, careful examination of the duodenum and the remainder of the gastrointestinal tract of the 2 dogs with jejunal transplants failed to reveal any pathological abnormality. The jejunal transplant in each dog had healed well and appeared unremarkable.

While the results in the first series of animals appeared highly suggestive so far as the action of a jejunal transplant in preventing duodenal ulceration following prolonged exposure to histamine was concerned, it seemed desirable to pursue the matter further and, if possible, observe the effect of the operation in the presence of duodenal ulceration. A second series of animals was therefore investigated; it consisted of 6 normal dogs, and 1 with a jejunal transplant in the stomach. All were given injections of the mixture of histamine and beeswax equivalent to 120 mgm. of histamine phosphate daily for a period of seven weeks. The animal with the jejunal transplant was observed for the entire period and was then killed while in the state of good health. The others were examined at various times during the experiment when they appeared ill. In all of the 6 previously normal animals hyperemia and lesions of the duodenal mucosa developed at some time during the experimental period. In 3, definite duodenal ulcerations extending into the muscularis were found, while in the remainder multiple mucosal erosions were to be seen. All suffered from anorexia and lost weight, and several had definitely tarry stools. In contrast, the dog with the jejunal transplant tolerated the prolonged exposure to histamine extremely well, remaining in excellent health throughout the experiment. At autopsy its stomach and duodenum appeared entirely normal.

The results suggest the efficacy of such transplants in preventing the development of duodenal erosions and ulcers during continued exposure to histamine.

In the single animal in which it could be satisfactorily carried out, implantation of a pedicled graft of jejunum into the gastric wall was followed by healing of the duodenal lesions despite continuation of the injections of histamine.

The clinical application of transplantation of a jejunal segment with an intact blood supply to the stomach in the treatment of peptic ulcer is suggested by these results. Further experimental work is in progress in an attempt to elucidate the mode of action of such a transplant and to establish its possible limitations. Such grafts have been shown to remain viable for long periods, provided their blood supply is intact, and animals have been observed in which the operation had been performed up to two and a half years before, during which time they had remained in excellent health despite other operative procedures. JOSEPH K. NARAT, M.D.

Hill, B. R., and Longwell, B. B.: Urinary Steroids from Patients with Cancer of the Breast. *Endocrinology*, 1943, 32: 319.

Several recent investigations concerning the relationship of steroids to human cancer have been directed toward the examination either of the excreta of cancerous individuals for the steroid content or of the excreta and tissues for carcinogenic potency.

The authors examined the urine of postmenopausal women with cancer of the breast, or with metastatic growths from this origin, for its steroid content. Among the compounds found by them, androsterone, 3-a-hydroxyetiocholanone-17, pregnandiol, and cholesterol have been isolated from the urine of normal women.

The comparison of the amounts of various fractions and compounds found by the authors with those found by other workers should not be accredited too much significance. The procedures used in different laboratories are not identical and are not designed as quantitative methods.

Comparison of the authors' results with those of other workers who have examined the urine of ovariectomized women, of normal women, or of cancerous men and women shows that the findings do not constitute positive evidence that the compounds isolated bear a relationship to the existence of malignant growths. JOSEPH K. NARAT, M.D.

EXPERIMENTAL SURGERY

Weiss, P.: Nerve Regeneration in the Rat Following Tubular Splicing of Severed Nerves. *Arch. Surg.*, 1943, 46: 525.

A method is reported by which severed nerve stumps can be united without the use of sutures. It consists in sealing the nerve ends into a common tightly fitting sleeve of live artery. Histological evi-

dence is presented, based on experiments on rats, which shows that when this method is used (1) a firm tie between the stumps is obtained (this has adequate tensile strength and offers the most favorable conditions to nerve-fiber regeneration); (2) nerve fibers regenerate in straight parallel courses; (3) regenerating fibers do not branch, nor do they stray about, intermingle, escape from the nerve, or form local neuromas; (4) regenerating fibers essentially retain their mutual topographic relations; (5) ingrowth into the nerve of fibrous connective tissue and strangling of nerve fibers by fibrosis are prevented; (6) no fibrous scars form at the suture lines; and (7) even the smallest nerves can be mended.

JOHN J. MALONEY, M.D.

Zondek, B., Mandl, F., Sulman, F., Brezezinski, A., and Tietz, H. G.: Heterotransplantation of Human Pseudomyxoma Peritonei into Mice and Rats. *Cancer Res.*, 1943, 3: 198.

Zondek showed previously that both homotransplants and heterotransplants of fresh or preserved ovarian tissue of human origin are rapidly absorbed after implantation in man and the lower animals, and that this process is accompanied by a simultaneous reduction of the hormonal effect on the organism of the host.

The present study was undertaken to find out whether ovarian tumors of human origin transferred to a foreign species likewise were subject to absorption with the same degree of rapidity. A particularly active type of ovarian tissue derived from a pseudomucinous cystadenoma ovarii from a fifty-four-year-old patient who had a perforating tumor with peritoneal metastases was used. According to clinical experience, the authors note that the human pseudomucinous cystadenoma ovarii displays a particularly vigorous local growth tendency, and since it may possibly be more embryonal in character than the majority of human transplants, the prospects that heterotransplants would survive for a considerable length of time were good. Furthermore the use of such a gelatinous material permits the diffusion of nutritive substances from the adjacent tissues of the host into the graft, while, on the other hand, the intrusion of fibrous elements resulting from the organization of transplants, is made difficult.

In a group of control experiments animals were engrafted with other varieties of gelatinous material of human origin; the transplants were Wharton's jelly, hydatidiform mole, myoma that had undergone gelatinous degeneration, serous cysts of the peritoneum, and mucous carcinoma of the uterus, and they were implanted into 33 mice, 31 rats, 4 guinea pigs, and 16 rabbits. The results were, briefly, the absorption and partial necrosis of all this control material in periods varying from a few weeks to two months. When the pseudomucinous material obtained from the cystadenoma had been first denaturated in formol with resultant destruction of the pseudomucin-producing cells, absorption likewise took place in a very short period of time.

Implantation of the original tumor material into rats and mice was successful in mice, but only in a few instances in rats. Intraperitoneal transplantation by the ventral approach was far less successful than by the dorsal approach. By the latter method the grafts took in the majority of cases and underwent extensive proliferation in the neighborhood of the kidneys. In the second mouse passage these transplants grew less vigorously, and in the third, not at all. The successful heterotransplantation is attributed to the excessive capacity of the adenoma cells to form pseudomucin.

The article is illustrated with several photomicrographs of sections from the successful grafts taken at various periods after implantation.

EDWIN J. PULASKI, M.D.

Laufman, H.: Gradual Occlusion of Mesenteric Vessels. *Surgery*, 1943, 13: 406.

The author reports an experimental study of the result of long-term gradual occlusion of the main mesenteric vessels. When a thrombus forms very slowly, collateral circulation has an opportunity to carry the blood supply. In some instances, a very gradual occlusion of the main mesenteric vessel may result in infarction of the intestine. In others, there may be temporary symptoms and pain and intestinal hemorrhage. There may be no symptoms at all if it forms slowly enough. This narrowing of the mesenteric vessels is not uncommon as a feature of generalized arteriosclerosis. The author briefly reviews the literature concerning such conditions seen clinically. He notes that experimental production of a long-term gradual occlusion of the main mesenteric vessels has not been reported previously.

The superior mesenteric artery was completely occluded in these experiments by a gradual constriction over a period of four months by the use of cellophane in 3 of 6 animals in which this procedure was carried out. A similar procedure constricting the superior mesenteric vein was successfully accomplished in 2 of 5 attempts. In the remaining animals the vessels were constricted but not completely occluded.

The result of gradual complete occlusion of the superior mesenteric artery was an anemia of the intestinal wall with a superimposed low-grade enteritis. Thrombi were present in the intramural vessels. Gradual complete occlusion of the superior mesenteric vein resulted in no demonstrable lesion of the intestine. Extensive collateral circulation was established in these animals, including the vascularization of omental adhesions and of the posterior parietal peritoneum.

HERBERT F. THURSTON, M.D.

Lynn, D., Bergh, G. S., and Spink, W. W.: Failure to Recover Sulfonamides from Gall-Bladder Bile in Dogs with Cystic Duct Obstruction. *Surgery*, 1943, 13: 447.

It has been demonstrated that sulfonamides are excreted in the bile of man and of certain laboratory animals, and there is clinical evidence that these

drugs exert a beneficial effect in some biliary-tract infections. On the other hand, in many cases of biliary-tract disease, there is no benefit from the drugs and hepatic injury may be produced, particularly after the administration of sulfanilamide. Acute obstructive cholecystitis is an instance in hand.

Desirous to learn whether obstruction of the cystic duct prevents these drugs from entering the gall bladder, Lynn *et al.*, isolated and ligated, without injury to the blood supply of the gall bladder, the cystic duct in 12 healthy adult dogs. The following day, when the animal had recovered from the operation, one of the sulfonamide drugs (sulfanilamide, sulfathiazole, or sulfadiazine) was administered by mouth. The animal was sacrificed later, and the level of the sulfonamide in the gall-bladder bile and in the venous blood was determined.

In each case, examination of the dog at the time of completion of the experiment showed that the ligature obstructed the cystic duct without interfering with the blood supply of the gall bladder. Sulfonamide was not found in any of the specimens of gall-bladder bile in spite of high blood levels.

It was concluded that sulfanilamide, sulfathiazole, and sulfadiazine do not enter the gall bladder of the dog when the cystic duct is occluded. They do not pass through the wall of the vesicle to reach the gall-bladder bile. STEPHEN A. ZIEMAN, M.D.

Warkany, J., Nelson, R. C., and Schraffenberger, E.: Congenital Malformations Induced in Rats by Maternal Nutritional Deficiency. The Malformations of the Extremities. *J. Bone Surg.*, 1943, 25: 261.

Congenital malformations are encountered in many fields of medicine. Their repair is associated with great difficulties, and the results of treatment are often unsatisfactory. It is desirable to prevent rather than to treat congenital defects. Apparently a great variety of factors can interfere with the normal development of the embryo. During the last few decades, the discovery of genetic factors leading to malformations has attracted a great deal of attention, while in mammals, at least, the research in the field of environmental teratogenic factors has somewhat lagged behind. A relationship has been found between a faulty maternal diet and anomalies of the offspring.

Developmental defects have been described in chick embryos whose mothers were fed grains containing selenium. Various authors have pointed to a lack of vitamin A in the maternal diet as a possible cause for various congenital malformations in pigs, calves, and rats. Micromyelia of chick embryos has been described as caused by a nutritional deficiency of the laying hens. Skeletal abnormalities have been described as occurring in rats reared on a deficient diet.

Congenital malformations, induced in rats by maternal nutritional deficiency, date back to the cartilaginous or precartilaginous stage of the structures affected. The defects of ossification are secondary results, caused by the faulty development of the precursors of the bones. Many cartilaginous structures show a lack of division in the longitudinal and transverse direction; this leads to a reduction in the number of the skeletal elements, and to syndactylism and brachydactylism in the paws. The radius, ulna, tibia, and fibula are frequently shortened in the cartilaginous stage. Ossification is delayed and faulty, and eccentric centers of ossification lead to an abnormal arrangement of the bone trabeculae.

ROBERT P. MONTGOMERY, M.D.

Blalock, A.: Effects of Lowering the Temperature of an Injured Extremity to Which a Tourniquet Has Been Applied. *Arch. Surg.*, 1943, 46: 167.

A total of 20 experiments was performed on large animals which had been anesthetized with pentobarbital. An injury was produced by striking the posterior extremity with a blunt instrument for a period between five and eight minutes. A tourniquet was then placed around the upper part of the traumatized extremity, and it was surrounded by ice. The ice was kept around the extremity for a period of eleven hours in every instance, and the tourniquet was left on for a period of five hours.

In the author's experiments on 10 of these animals, sufficient plasma to correspond to 5 per cent of the weight of the animal was injected during a five-hour period beginning immediately after the removal of the tourniquet. Five of the animals died. In a previously reported series of comparable experiments in which no ice was used, all of the animals had died. In most of the experiments a slight dilution of blood, as determined by the hematocrit, and a rather rapid fall of temperature were noted. The survival period of the animals that died was from fifteen to twenty-two hours. The average loss of fluid into the injured part was 5.4 per cent of the body weight. The cause of death would appear to be trauma, plus ischemia and anemia incident to the tourniquet. Trauma alone is not so damaging. Cooling appears to decrease the metabolic processes or other alterations.

In the experiments on the 10 remaining animals, no plasma was injected; otherwise the experiments were carried out in an identical manner. Four of the animals recovered. In most of the experiments an increase in the hematocrit reading and a great decline of rectal temperature were observed. The survival periods of the 6 animals that died ranged from seventeen to thirty-eight hours. There was an increase in weight of the injured extremities amounting to 5.41 per cent of the body weight. These results appeared to be almost as good as those which were obtained with the use of plasma.

According to the authors these experiments indicate that the use of a tourniquet on an injured extremity should be avoided whenever possible, but if it is necessary to render the distal tissues ischemic and anemic by means of constriction it is best to lower the temperature of that extremity by artificial means. LEROY J. KLEINSASSER, M.D.

Duncan, G. W.: Inorganic Phosphorus Content of the Serum in Shock. *Arch Surg.*, 1943, 46: 214.

The effects on the level of serum inorganic phosphorus, of shock produced in dogs by experimental crush injury, by hammer blows, and by hemorrhage, are reported.

In shock produced by each of these methods the serum inorganic phosphorus is elevated. The time relation between this elevation and changes in the hematocrit reading and the arterial pressure are recorded in tables and graphs. Hyperphosphatemia occurred early in most of the experiments in which shock was produced by crush injury and by hammer blows. In the experiments in which shock was produced by hemorrhage this early hyperphosphatemia was less marked and less consistent.

WALTER H. NADLER, M.D.

Wakim, K. G., and Gatch, W. D.: The Effect of Temperature on Shock. *J. Am. M. Ass.*, 1943, 121: 903.

In the treatment of shock, the application of heat is too much stressed. In first-aid instructions one is taught to apply hot water bottles, hot bricks, or heated stones to the extremities and sides of the patient. Not only is warmth recommended, but heat has been advised.

In this series of experiments it was demonstrated that the survival time of anesthetized animals in shock, produced by intestinal stripping, was greatly shortened by the application of heat or cold to the body. Animals placed at room temperature or on warm water bottles slightly above room temperature, after shock was produced, survived for a much longer time. An external temperature in the neighborhood of body temperature proved to be optimal.

The animals studied were dogs, rabbits, guinea pigs, and rats. Soluble pentobarbital was the anesthetic used. In the rat, trauma to the lower extremities, or exposure of the abdominal viscera and intestinal stripping was used to produce shock, but because the latter method proved more uniform it was the only method used in the other animals. Series of animals were placed on ordinary clinical rubber bags, or on specially constructed constant temperature platforms at the following temperatures: 5°C., 25°C., 35°C., 45°C., 50°C., and 55°C. After shock was produced, the survival time of each animal in the six groups and the average survival time of each group were determined.

Hemoglobin determinations were made during the course of the experiment, and blood-pressure tracings were made on the large animals.

The experiments on rats, guinea pigs, rabbits, and dogs in shock yielded similar curves of survival time plotted against the various external temperatures. Temperatures below that of ordinary room temperature, and those above 45°C., had deleterious effects on shocked animals. Control studies on normal animals indicated that both extremes of temperature, the ice bag at 5°C. and the hot water bag at above 50°C., had deleterious effects.

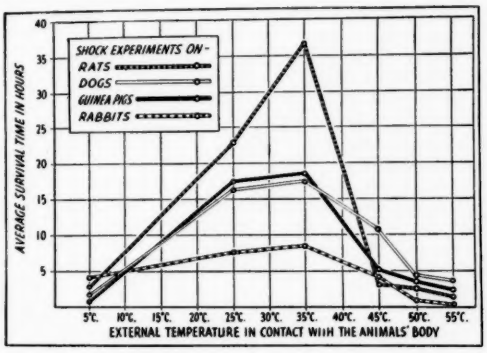

Fig. 1. The average survival times of different species of experimentally shocked animals which were placed at various external temperatures.

One physiological mechanism to compensate for the decreased blood volume in shock is an immediate generalized peripheral vasoconstriction. This manifests itself by blanching of the skin and contributes to the sensation of cold experienced by the patient. Application of heat may result in peripheral vasodilatation and defeat the normal compensatory mechanism. Excessive heat may do harm in several ways; it may:

1. Produce widespread superficial vasodilatation and distribution of blood to nonessential parts.
2. Increase the metabolism and oxygen requirements of the tissues.
3. Increase perspiration and promote dehydration.
4. Cause burns from improper application.

The physiological mechanisms involved in the production of superficial vasodilatation as a result of heat to the skin are:

1. Direct local dilator effect of heat on the blood vessels.
2. Central hypothalamic inhibition of vasomotor tone induced by the rise of temperature of the circulating blood.
3. Reflex inhibition of vasomotor tone.

This study indicates that the shocked individual should be protected from cold by wrapping in blankets, but he should not be heated up by the use of hot water bottles. The room temperature should be kept at about 85°F., and every effort should be directed to avoid chilling or overheating.

JOHN A. GIUS, M.D.

Maisel, B., McSwain, B., and Glenn, F.: Effects of the Administration of Sodium Sulfadiazine to Dogs. *Arch. Surg.*, 1943, 46: 326.

Dogs given subcutaneous injections of a 20 per cent aqueous solution of sodium sulfadiazine had initial blood levels of from 10 to 15 mgm. per 100 cc. Within a few days renal insufficiency with rising levels of urea and sulfadiazine in the blood set in, and several of the dogs died in from one to three

weeks. Some showed a rise in the arterial blood pressure; all showed proteinuria and hematuria.

In addition to the deposits of sulfadiazine precipitated in the renal tubules and renal pelvis with granulomatous reactions about them, there were perivascular and even some glomerular granulomas. Instances of phlebitis and interstitial reaction in the kidney and other viscera were more numerous than those reported in other investigations of the toxicity of sulfonamide compounds. Focal necrosis in the bone marrow occurred in 1 of 14 dogs, and hypoplasia of the bone marrow occurred in another. All animals had evidence of hemolytic anemia. Degenerating germinal centers were present in the spleen in nearly all.

Although there was no change in the platelets or prothrombin, some visceral petechial hemorrhages were noted. There was no apparent damage to the liver.

The dog, which has an acid urine, shows unusually severe renal damage from doses of sulfadiazine within the therapeutic range. Extrarenal perivascular inflammation is also striking. The relative importance of parenteral deposits of the drug and of the acidity of the urine as factors predisposing to these severe lesions has not been determined.

The authors' studies indicate that sodium sulfadiazine injected subcutaneously into dogs produces pathological changes of the bone marrow, blood, blood vessels, and kidneys. The combination of ether anesthesia and sulfadiazine did not alter the changes found following the use of the drug alone.

That renal physiology is disturbed is suggested by the retention of nitrogenous waste products and the elevation of blood pressure in some animals and the development of proteinuria and hematuria in all animals. Hematuria often occurred prior to the development of sulfadiazine crystals in the urine and indicated a primary injury to the renal structures, independent of the effect of tubular obstruction produced by the precipitation of sulfadiazine crystals in the nephron. That sulfadiazine is retained by damaged kidneys is suggested by the high blood levels that developed late in the period of administration.

Sulfadiazine crystals were precipitated not only in the pelvis and collecting tubules but as high in the nephron as the descending loop of Henle. Many subcapsular tubules contained crystals. Acidity of the urine may be an important factor affecting the precipitation of this drug, and further studies are desirable to ascertain whether the renal damage can be controlled by alkalinization of the urine.

The damage to glomeruli and tubules may terminate in the destruction of these structures with formation of a granulomatous lesion, and recovery of a nephron thus scarred seems unlikely. However, most nephrons are not scarred.

The mechanism of the development of hyperchromic anemia is obscure. That erythrocytes are destroyed is indicated by the presence of hemosiderosis in the bone marrow, the spleen, and the liver. The hyperplasia of the bone marrow in some animals is probably a response to the destruction of erythrocytes.

JOSEPH K. NARAT, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Armstrong, D. B.: Health Education and Appendicitis Mortality Rate. *Brit. M. J.*, 1943, 1: 277.

The following observations are based on experience with approximately 17,000,000 industrial policy holders of the Metropolitan Life Insurance Company in the United States and Canada. This large group is composed mostly of men, women, and children in the wage-earning groups of the population.

The maximum rate of mortality for appendicitis, reached during the period from 1929 to 1932, has been followed by a consistent decline since 1933. From 1933 to 1939 a decrease from 13.2 to 10.3 per 100,000 is believed to reflect, in large measure, the effect of health education which was undertaken with vigor during that time. Although this health education has continued, the effect of new therapeutic discoveries, notably the sulfonamides, has complicated its relation to mortality in the period from 1940 to 1943.

The success of this health education program resulted from the efforts and co-operation of numerous agencies. The medical profession, the insurance company agents, the drug and pharmaceutical representatives—all have done their part. Numerous devices and methods have been utilized to obtain results, including the use of the press, the radio, commercial advertising, leaflets, and lectures. Through this organized effort to instruct the lay public in the dangers of catharsis and delayed operation worthwhile results have been obtained, which indicate the value of this method to improve the public health.

EDWARD W. GIBBS, M.D.

Meirowsky, A. M., and Pipito, F. F.: The Surgical History of Trigeminal Neuralgia. *Arch. Neur. Psychiat.*, Chic., 1943, 49: 574.

The condition of trigeminal neuralgia is said to have been referred to as early as 400 B.C. and in the writings of Hippocrates, Aretaeus, and Galen. A description of this condition was given in the eulogy of Dr. Bausch by Fehr and Schmidt in 1672.

Although André in 1756 first used the term "tic douloureux", the first classic description was given by Fothergill in 1776.

In the first operative period, from 180 A.D. to about 1840, the procedure consisted of severing the peripheral branches of both the fifth and seventh nerves. This was first done by Galen. Other modifications used were: crushing and cauterizing by von Klein in 1822, interposition of soft tissue, evulsion by Thiersch, and stretching by Vogt in 1876. Warren in 1828 first sectioned the nerve proximal to the foramen.

In the second period the attack was made on the gasserian ganglion, which procedure was first suggested by Carnochan in 1858 and attempted in 1889

by Abbé. Although Horsley in 1891 made an unsuccessful attempt, the next year Rose successfully performed the operation through the pterygoid region. However, Hartley's temporal approach enjoyed the most success. It was soon recognized that cutting the first division resulted in corneal ulcerations, and Tiffany in 1896 suggested a partial ganglionectomy and also the sparing of the motor root.

The third period was ushered in by Frazier and Spiller in 1901, at which time Frazier sectioned the sensory and motor root, but mentioned that the motor root could be spared. In 1921 he suggested differentiating the roots by electrode stimulation, and in 1925 he sectioned only the outer two thirds. This same year Dandy employed the suboccipital pontine approach. Differential sectioning of the sensory root according to the area of the face involved was first advocated by Stookey in 1928.

In the fourth period sectioning of the tract in the brain is being studied. Serra and Neri sectioned the quintothalamic tract in 1936. Sjöqvist in 1938 sectioned the trigeminal bulbospinal tract in the medulla oblongata. However, serious complications have developed from Sjöqvist's section. To prevent these occurrences, Olivecrona, only last year (1942), suggested sectioning the tract at a lower level to avoid injuring the restiform body or vagas fibers.

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MEDICAL JURISPRUDENCE

Joslin, E. P.: The Relation of Trauma to Diabetes. *Ann. Surg.*, 1943, 117: 607.

The thesis that trauma *de novo* can cause diabetes has steadily lost support with the expanding knowledge of the disease. However, evidence has accumulated to show that trauma indirectly can activate or accelerate the appearance of a latent diabetes in the hereditarily predisposed, particularly if accompanied by infection, reduced muscular exercise, gain in weight, or overeating.

Trauma in the course of diabetes has grown in importance because the duration of the disease has trebled, which has lengthened the period of exposure. Moreover, the danger of exposure to trauma is intensified each successive year a diabetic lives, because time is provided for the disabling complications of the disease to appear and the physical infirmities of the normally aging process to advance.

The tissues of a diabetic are more vulnerable than those of a nondiabetic.

Emotional, nervous, or so-called neurogenic diabetes, as von Noorden well said, was put "into the grave" by the Great War, and there it is likely to remain unless exhumed during the present conflict.

To prove that trauma is the cause of diabetes in any individual case evidence must be at hand to show (a) that the disease did not exist before the trauma; (b) that the trauma was severe and injured the pancreas; (c) that the symptoms and signs of the disease developed within a reasonable period following the trauma, the etiological importance of the trauma waning with the prolongation of the interval; and (d) that the symptoms and signs of diabetes were not transitory but permanent.

This question of trauma as the cause of diabetes should be kept absolutely distinct from the question of compensation of an individual who is found to have diabetes following an accident. Too often, especially in foreign publications (Lommel, Troell), the two are confused, and for social and governmental insurance reasons the court sitting in judgment on a case may vote to give the insured the benefit of a doubt which has no factual basis. Many European countries are saturated with social accident insurance, and if a citizen is not in the employ of the government, at least he expects a liberal interpretation of social or insurance benefits.

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Warren, S.: Minimal Criteria Required to Prove Causation of Traumatic or Occupational Neoplasms. *Ann. Surg.*, 1943, 117: 585.

A tumor, in the medical sense, is a new growth or neoplasm and is classified according to the type of cell it tends to reproduce. Microscopic examination of a section obtained from the substance of a tumor should always be made for diagnosis, classification, and determination of the probable rate at which it will grow.

As ordinarily used, the term traumatic cancer implies a malignant tumor which has arisen from a single mechanical injury which produced a break in the continuity of one or more of the body tissues.

Tumors Due to Mechanical Trauma. The minimal criteria necessary are: first, the integrity of the tumor site prior to injury must be established; second, the injury must be sufficiently severe to disrupt the continuity of the tissue or produce extravasation of blood into the tissues, and so initiate reparative proliferation of cells; third, the tumor must follow the injury by a reasonable length of time; and fourth, the tumor must be of a type which might reasonably develop as a result of the regeneration and repair of those tissues which had received injury.

The author does not favor the evidence of so-called bridging symptoms, that is, symptoms that continue to give evidence of the continuance of disability from the time the injury is sustained to the time the tumor makes its appearance. In general, four weeks may be regarded as the minimal time for the appearance of a rapidly growing tumor following the occurrence of an adequate injury; the maximal limit should not be more than three years after injury.

The type of tumor which develops at the site of injury is important. Any tumor of cell type foreign to the part would be considered metastatic rather than primary. Scars are particularly prone to malignant change, especially in ulcerated areas. The latent period before scars become cancerous may be extremely long, instances of fifty years or more having been reported. Certain types of cancer may develop following chronic irritation, when repeated

trauma activates degenerative and attempted reparative changes over a long period of time. Chronic ulcers may be a source. The question of malignant transformation of a benign tumor is not settled. It is difficult to decide whether a malignant variant of the same cell type has developed, although it is to be remembered that this transformation may occur without trauma. However, evidence appears sound that benign pigmented nevi may be converted into malignant melanomas by single or repeated injuries of various sorts.

Occupational Tumors. Occupational tumors are those that arise as a result of contact with some exogenous agent, physical or chemical, which is brought about by some phase of the regular work of the individual concerned and leads to an independent proliferation of cells.

The soundest criterion for the occupational character of a neoplasm is the proof of the occurrence of a tumor of a particular type and in a particular portion of the body among the workers of a given industry significantly more frequently than in the general population of comparable sex and age. As secondary proof of the occupational character of a tumor, the production of tumors in experimental animals by the suspected agent is of great value, but it is not a prime requisite. It is not enough to know that an individual works in a general field, but the exact nature of the substance causing the malignancy is important. Occupational tumors must be sharply distinguished from tumors which arise spontaneously in employed individuals being exposed to radioactive material or betanaphthylamine at the present time. A change in occupation during the latent period also complicates the picture.

A useful classification of occupational tumors is that given by Hueper, a modification of which is presented:

1. Direct-contact tumors
   a. Cutaneous neoplasms caused by direct local action of mineral oil, crude paraffin, creosote, anthracene, solar rays, ultraviolet rays, roentgen rays, and rays from radioactive substances upon the cellular components of the skin
   b. Pulmonary tumors resulting from the inhalation of radioactive material, chromates, asbestos, nickel carbonyl, and tarry substances
   c. Tumors of the nasal passages and sinuses following upon the exposure to radioactive substances, chromates, and nickel carbonyl
   d. Neoplasms resulting from impingement of roentgen or other radiation on the deeper tissues
2. Excretory-contact tumors
   a. Tumors of the urinary tract resulting from an exposure to certain aromatic amines excreted in the urine
3. Depository-contact tumors
   a. Cancers of the skin associated with the deposition of arsenicals in the cells of this organ
   b. Sarcomas of bone, leucemia, and leucemoid reactions following the storage of radioactive material in the bones
4. Tumors in tissues as a result of parasitic infestation
   a. Cancer of the bladder following bilharziasis

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